Electrical Review

Vol. 79—No. 5. CHICAGO, SATURDAY, JULY 30, 1921. Page 149.

Light and Power Installation at Pageant of Progress

Complete Transformer Substation of 2000-kw. Capacity Erected to Supply Energy for Motors and Illumination—Large Number of 400-Watt Lamps Employed to Produce High General Lighting

By R. W. ASHLEY

Electrical Engineer, Hub Electric Co., Chicago.

Three rows of lamps suspended high above the floor, and almost concealed in the flags and bunting decorating the ceiling, serve to light the great upper decks of Chicago's municipal pier where the Pageant of Progress Exposition is to be held during the coming 2 wks. The two decks, each 2340 ft. long, are divided into bays 20 ft. wide by 67 ft. across, and three 400-watt type C lamps are suspended over each bay. The fixtures used were supplied by the Harter Manufacturing Co. and are equipped with pear-shaped diffusing glassware. Such an arrangement, with the overhead drapes and hangings in place, should give a general illumination in the neighborhood of 6 to 8 foot candles. Together with the individual booth lighting provided by the various

Transformer Substation Under Construction—Third Pittsburgh Transformer Installed Later—Line Vault Door in Rear.

View Down One Side of Exposition Floor, Showing Booths Under Construction and Lighting Fixtures in Place—Overhead Decorations Not in Place.

exhibitors the general lighting should average not less than 10 foot candles, with many locations where this value will be much exceeded.

As a means of illustrating what this lighting installation amounts to it may be stated that, if used with suitable equipment, the energy required would serve a modern boulevard street lighting system 25 mi. in length; or it would supply more than enough residence lighting for a town of 7500 people.

It is interesting to note that a large part of this lighting equipment, together with power circuits and a complete transformer substation of 2000 kv-a. capacity, was installed within a 42-day period between the letting of the contract and the opening of the exposition. The Hub Electric Co. did all the work, including the rearrangement of the old equipment, the connecting up of two 12,000-volt transmission lines over which energy is supplied from the system of the Commonwealth Edison Co., the installation of one 1000 kv-a. and two 500 kv-a. Pittsburgh transformers, and all needed new circuits, cabinets, switches, fuses, fixtures, lamps, etc.

As has already been stated energy is supplied over two 12,000-volt transmission lines that terminate in a line vault built particularly for the purpose. Each line terminates in a bell near the roof of the vault, from which the three conductors separate and cross over to the framework supporting the oil switches. The circuits go down through Delta Star disconnects and General Electric line current transformers to K-32-A hand-operated, 12,000-volt, 600-ampere oil switches. From the oil switches the circuits again go up through a second set of disconnects and turn across the ceiling, going through two current transformers for metering and then through wall bushings into the transformer room. From the transfer bus, to which both lines to the transformer vault connect through a third set of disconnects, taps are taken off for leads to three 200-watt 13,200 to 132-volt potential transformers. Schweitzer & Conrad fuses are used to protect the potential transformers.

Disconnect switches used in the line vault are connected with the blades attached to the conductors from the switch. Extra clips in the disconnect compartment provide for the direct grounding of the switch through the disconnect blade. The operating handles for the control of the oil switches are mounted on the transformer side of the wall separating the line vault from the transformer room.

The lines coming through the separating wall into the transformer room go through disconnects and switches, as shown in the illustration, and then to the three Pittsburgh 3-phase transformers. These transformers reduce the potential to 4000 volts at which pressure energy is distributed through cables to eight transformer vaults located along the lower decks of the pier. The lines from the main transformers to the eight vaults pass through the old switch room and switching equipment formerly used to receive and distribute energy at 4000 volts.

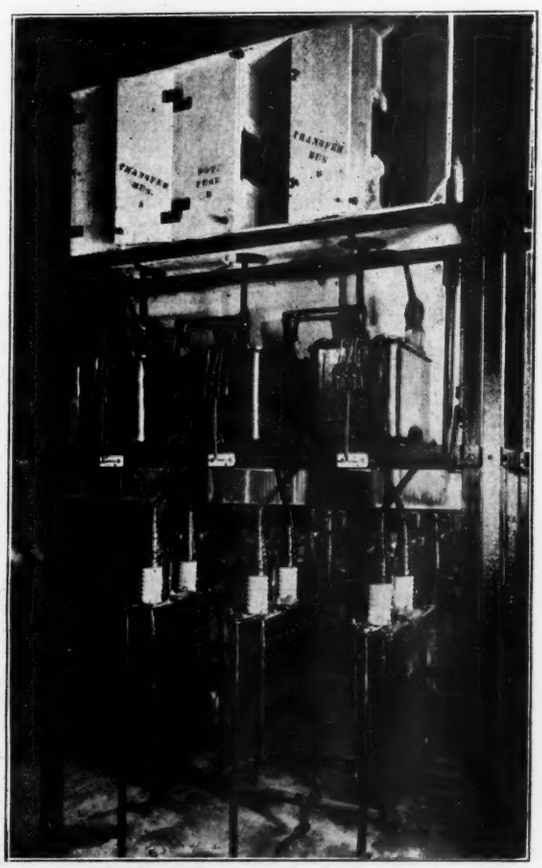
At the eight subvaults the voltage is again reduced to 220 volts for power and 110-220 volts

for lighting. In these vaults banks of three transformers are installed. In most cases these sets consist of one 100-kv-a. and two 50 kv-a. transformers, one 125 kv-a. and two 75 kv-a. transformers being used in some locations where the load is extra heavy. All transformer sets are star connected on the primary side, with the neutral grounded. Transformer secondaries are connected in delta, with the neutral for the 110-volt lighting circuits taken from the midpoint of the larger transformer.

Two 3-wire 400,000-cir. mil circuits are taken out from each subvault, one circuit being carried to each side of the pier deck. Each of these circuits is divided into four branches, two for power and two for lighting. The power branches are taken off through 100-ampere 3-pole switches, and the lighting circuits through 200-ampere 3-pole switches. One lighting circuit and one power circuit runs east and similar circuits run west on each side of the pier deck. For each four bays on each side of the deck one lighting and one power cabinet is connected up. The power cabinets are provided with switches and fuses for six circuits, provision being made in the lighting cabinet for 10 circuits.

Division of Power for Various Purposes and Applications.

The general illumination already mentioned requires a total of over 700 lamps rated at 400 watts, and for the supplying of these a capacity of 300 kv-a. is set aside. An additional 100 kv-a. of transformer capacity is reserved for illumination of the walks at the side of the pier decks and on the roof. Still an additional 250 kv-a. is assigned to other lighting in space not utilized directly for the exhibition. A total capacity of 1400 kv-a. is reserved for the power and lighting requirements of the exhibitors.



Switching Equipment for One of the Two 12,000-Volt Lines.

The oil switches, current transformers and potential transformers in the line vault and transformer house were supplied by the General Electric Co. The disconnects and insulators for the 12,000-volt work were supplied by the Delta Star Electric Co. A remote-control board in the old substation is employed in switching the 4000-volt lines, a Universal storage battery being used to supply energy for the operating bus and to serve various signal and alarm circuits. The National Metal Molding Co. supplied the conduit, and the Western Electric Co. and the Atlantic Insulated Wire & Cable Co. supplied the wire. Economy and Buss fuses are used in distribution cabinets.

The cutout cabinets used were supplied by the Chicago Switchboard Co., the panels being made up by the Hub Electric Co. The transformers in the subvaults were of General Electric, Pittsburgh, Maloney and Westinghouse make. The glassware used with the lighting fixtures was produced by the Harter Manufacturing Co., and is known as "Glorianna" glassware. It is made up of two distinct pieces of glass fused together, the inside portion being diffusing in character and the outside transparent. The outer layer of glass gives strength and finish, while the inner thin layer diffuses the light with little loss.

BUSINESS RELATIONSHIP BETWEEN ENGLAND AND GERMANY.

The personal element in business is absolutely lacking in the new commercial relationship between Germany and England, according to R. L. Jones, head of the transmission engineering department of the Western Electric Co., who recently returned to New York City after a year in Europe. The English feel that the easiest way of getting their indemnity from Germany is on a cold-blooded business basis. Despite their national distaste for their former foes they are going ahead closing contracts with the representatives of the Central Powers whenever the latter make any attractive financial proposals.

Mr. Jones says that German agents have been flocking to London ever since the two countries signed their commercial treaty. The very hotels that showed such antipathy to delegates of the Ebert government when they crossed the channel to settle the Ruhr question, now harbor countless numbers of their business brethren. However, the German visitors and their English customers are making no attempt to meet each other socially. Once they have concluded their business engagements they seem glad to forget each other's existence. The French have been slower than the English in forgetting their animosity to the Germans.

It is understood that a plan for the construction of nine hydroelectric plants to use the waters of the Sho and the Chigusa rivers is being considered by the Hyogo Prefectural Assembly of Japan. It is proposed to begin construction in 1921 and to complete three plants every 2 yrs. until 1926.

Electrical Exhibits at Pageant of Progress Show

Great Array of Handicraft of Industry Shown in Modern Labor Saving Household Appliances, Industrial Devices and Electrical Materials, Electric Transportation by Rail, Water and Air

By WILLIAM B. EASTWOOD

The Pageant of Progress opens its doors today (July 30) with more than 3.5 mi. of exhibits, chiefly of an industrial nature. In all this vast array of progressiveness electricity plays by far a greater part than any other factor. In this wonderful portrayal of the activities of the country there are displayed automobiles, clothing, packing, machinery, books, advertising, printing, lithography, paper products, dairy products, building materials, lighting, heat and power, transportation by rail, water and air, and many other products of industry, all of which utilizes or depends in some measure upon electricity. In no part of this immense exposition is there an exhibit that did not depend in some manner, large or small, upon electricity for its fabrication, or on electricity for its operation.

While the many and varied applications of electricity are everywhere manifest throughout the exposition, there is one large section given over exclusively to modern appliances and conveniences that depend entirely upon electricity for their operation. In this section, as well as scattered throughout the other sections, manufacturers of electrical apparatus, devices and materials have taken advantage of the opportunity for which the Pageant of Progress was instituted —the stimulation of trade and industry suffering from the universal reaction following the war.

ELECTRICAL REVIEW has undertaken to list all the electrical exhibitors participating in the exposition, together with details of the display and persons in charge. The task, however, was greater than was anticipated and some are necessarily, but regretfully, omitted because they failed to have their exhibits in place or their representatives on hand until the last moment.

Exhibitors who are listed herewith are given alphabetically by their firm names, with their booth number, the person in charge and the character of the display where possible to obtain such data in time for this issue of ELECTRICAL REVIEW.

EXHIBITORS IN ELECTRICAL SECTION HAVE GREAT VARIETY OF DISPLAYS.

Albaugh-Dover Co., 2100 Marshall boulevard, Chicago; Space 31; Lee R. Hayes in charge. In this space four "Butterfly" washing machines will be in operation with a salesman in charge of each.

Altorfer Brothers, Peoria, Ill.; Space 54. This company will demonstrate the "ABC Super-Electric," "Alco," and "Twin Alco" washers and the "ABC Electric Laundress" ironing machine.

American Ironing Machine Co., 168 North Michigan boulevard, Chicago; Space 51; C. F. Barkow in charge. The old and new way of ironing will be shown by the use of the modern electric and gas ironers and the old-fashioned skirt board.

Chicago Electric Sign Co., 2225 West Grand avenue, Chicago; Space 2B. All kinds of electric signs.

Chicago Elevated Railways; Space 25; J. J. Moran in charge. In a large frame at the back of the booth will be shown a relief map of Chicago. This map, in natural colors, tells the history of progress in street railway construction. Each stage of development or extension is shown on the map in a color corresponding with the same color on panels at the side containing statistics. Photographs of the pioneer system, operated with steam locomotives, will be shown.

Chicago, North Shore & Milwaukee Railroad; Space 27; J. J. Moran in charge. In this booth will be shown by means of motion pictures and a panorama the evolution and development of transportation over the Green Bay Trail along the North Shore. The scene starts with aborigine life along the old trail, showing Indians on the move, hunting and in camp. The final scenes show the de luxe electric trains now running between Chicago and Milwaukee.

Chicago Surface Lines; Spaces 22, 24, 34 and 36; U. G. Lee in charge. Many interesting features of street railway development in Chicago, including statistical charts, relief maps and photographs will be shown in this large booth.

Clements Manufacturing Co., 609 Fulton street, Chicago; Space 55; A. A. Brewer in charge. In this booth will be demonstrated the "Cadillac" vacuum cleaner, portable hand blowers and the entire line of "Reliable" washing machines.

Commonwealth Edison Co., Chicago; Spaces 14, 16, 42 and 44; Oliver R. Hogue in charge. This large booth is divided into two parts. One half will show an electric village connected to a small substation, the whole electrically lighted. This half will also contain pictures and models showing the growth of the Commonwealth Edison Co., also a number of views depicting activities of the employes—their annual field day, orchestra, choral society, glee club, baseball league, bowling league, rifle club, etc. The other half of the booth will be devoted to actual working demonstrations of labor-saving

devices, including electric washers, cleaners, ironers, kitchen units, sewing machines, fireless cooker, waffle iron and all other electric household appliances.

Coyne Trade and Engineering School, 43 East Illinois street, Chicago; Space 18; Ralph S. Ingham in charge. Views of the activities in the school will be shown in this booth. There will also be a large map indicating the location of the school with reference to the exposition and escorts will be furnished visitors who wish to inspect the school.

Delight Utilities Co., 3700 West 26th street, Chicago; Space 53; L. Spachman in charge. This company will demonstrate "Surf" clothes washers, "Keystone" ironers and "Hugro" vacuum cleaners.

Detroit Electric Car Co. of Illinois, 2416 South Michigan avenue, Chicago; Space 23; H. W. Corris in charge. In this space will be shown the company's electric passenger car and a display board showing parts of the electric vehicle battery.

Easy Electric Shop, 30 West Monroe street, Chicago; Space 46; V. J. Bagnet in charge. In this booth will be demonstrated the G.R.S. clothes washer and the Hoover suction sweeper. There will also be a display of portable electric lamps.

Eden Appliance Co., 162 West Monroe street, Chicago; Space 52; M. E. Oberdorfer in charge. Demonstrations will be given with the "Eden" washing machine, the "Utenco" ironer and the "America" vacuum cleaner.

Edison Electric Appliance Co., 5660 West Taylor street, Chicago; Space 45; J. F. Roche and G. M. Gunderson in charge. This space will appeal strongly to both the electrical dealer and the consumer. A portion of the booth will be given over to the assembling of the "Hotpoint" flatiron just as it is done in the factory. The entire "Hotpoint-Hughes" line of electrical appliances will be shown. There will also be percolator tests and a cooking demonstration with the latest type of electric range.

Edison Storage Battery Co., 3130 South Michigan avenue, Chicago; Space 17A; E. C. Riley in charge; displaying various types of "Edison" batteries.

Electric Storage Battery Co., 18 East 25th street, Chicago; Space 19B; R. H. Mariner and H. J. Olson in charge; showing "Exide" batteries of various sizes for different uses.

Electric Vacuum Cleaner Co., Cleveland, O. (Represented by Premier Service Co., Chicago.) Space 35; H. U. Mann in charge; demonstrating "Premier" vacuum cleaners.

Electric Water Sterilizer & Ozone Co., New York City; Space 29B; exhibiting an electric water sterilizer.

Electrovoice, 160 North Wells street, Chicago; Space 12; B. E. Cover in charge. This is a new amplifying voice transmission system which is being here demonstrated for the first time. Transmitting horns are located throughout the exposition and announcements are made and music of the phonograph is disseminated.

General Electric Co., Schenectady, N. Y.; Spaces 37, 39, 41 and 43; C. T. McLoughlin in charge. Tracing the history of electrical development from early times to the present, the General Electric Co.'s exhibit will be one of startling contrasts and interesting comparisons. Chief among the displays will be the famous historical lighting exhibit portraying by model reproductions and actual apparatus, the history of modern lighting from primitive times up through the ages to the development of the first incandescent lamp and the improvements which have since been effected in the science of illumination.

Vieing in interest with this exhibit will be the display of early motors, meters and arc lamps loaned for the occasion from Prof. Elihu Thomson's laboratory at Lynn, Mass. This exhibit will consist of two arc lamps, one of the D type which was made about 1881 and the K and M types (M being the double carbon lamp) developed in 1884 and very extensively used. Prof. Thomson is sending an early type meter hardly changed from the first meters manufactured. This type of motor meter was developed about 1889 and the particular motor probably belongs to the period within 2 or 3 yrs. of that time. It still has the old drum armature and the copper disc camper.

Included in the arrangement of early models will be four early fan motors and one ceiling fan motor. Two of these are among the first types of d-c. motors built and two are of the shaped-pole type, the ceiling fan motor being of this type also. They date back to the period after 1890. These were products of the Thomson-Houston Co. at Lynn. In the motor display will also be odd forms of early experimental motors one of which will be a box motor of small power adapted to be used on arc current. There will also be an early form of d-c. motor with round frame.

Over against the historical display, made in keeping with the purposes of the exhibition, will be an extensive line of fractional horsepower motors for scores of commercial and industrial applications, a complete modern turbogenerator and headlight for locomotive service, compared to the original oil locomotive headlight, and sample boards containing an exhibit of insulating materials and wire and cable.

One of the biggest features of the exhibit will be a complete automatic arc welding machine in actual use, welding type K-35 oil circuit breaker tanks. There will also be a complete line of arc welding accessories.

Goodrich Transit Co., 104 South Clark street, Chicago (representing Radio Corp. of America, Cleveland); Space 15; Park Robbins, general passenger agent, in charge. In addition to a display of radio apparatus there will be a model of the S. S. *Alabama* of the Goodrich Line, equipped with a wireless installation.

Heald Machine Co., 26 South Jefferson street, Chicago; Space 4A; exhibiting electric grinding machines.

Hermes Manufacturing Co., 448 North Wells street, Chicago; Space 6. In this space will be demonstrated a novelty in electrical apparatus —an electric shoe-shining stand with a lady attendant. Electrically operated brushes and pol-

ishers are employed by the attendant after the customer is comfortably seated and the seat and footrest are properly adjusted.

Home Utilities Co., 320 May street, Chicago; Space 13. This company specializes in "Klymax" washing machines and will have a demonstration of this line in its booth during the exposition.

Hoover Suction Sweeper Co., North Canton, O.; Space C-1. Cleaners made by this company are not only demonstrated in this booth but also in the booths of a number of distributors throughout the exposition.

Hub Electric Co., 2225 West Grand avenue, Chicago; Space 2A. This firm of electrical contractors made all the special installations for the exposition and has provided a booth in which its friends and clients from out of the city may rest and receive directions as to points of interest.

Hudson Battery & Supply Co., 2856 Quinn street, Chicago; Space 29A; showing full line of batteries.

Humphrey Co., Kalamazoo, Mich., and 204 South Wabash avenue, Chicago; Space 9; R. H. Nowlin in charge. This company will display a complete line of its products, including gas water heaters and radiant fires for open fireplaces.

Hurley Machine Co., Chicago; Space 47; D. J. Hartnett in charge. Popular "Thor" clothes washers and ironing machines will be demonstrated in this booth.

Illinois Bell Telephone Co., 212 West Washington street, Chicago; Space 11; A. R. Bone in charge. In this space the company will have an installation of a miniature "A" and "B" switchboard with handsome operators in charge to show how calls come in, connections are made and calls registered. For the convenience of the visitors at the exposition the company has installed pay station service at various points about the pier with messengers in attendance.

Jewel Electric Co., 17 North Wabash avenue, Chicago; displaying and demonstrating full line of washing machines, vacuum cleaners and other electrical household appliances.

Judd Co., 209 North Michigan boulevard, Chicago; Space 56; H. S. Judd in charge. This company will display and demonstrate the "Horton" ironer, "Easy" vacuum clothes washer and "Allmur" fireless cooker.

Lindsey Light Co., 161 East Grand avenue, Chicago; Space 1; R. P. Sullivan in charge. The exhibit will consist of a display of the raw materials and the various processes in the making of gas mantles.

Lionel Corp. of New York, New York City; Space 19A; displaying electrical toys, games and novelties.

Little Giant Washing Machine Co., 126 North Union street, Chicago; Space 29B; L. Greenberg in charge. This exhibit will consist of demonstration and display of the "Little Giant" washing machine.

Mercury Manufacturing Co., 4118 South Halsted street, Chicago; Space 17B; L. J. Kline in charge. This company will have in its booth a sample of its industrial electric truck known as the "Trackless Train." During the installation of exhibits in preparation for the Pageant of Progress exposition a number of these little electric trucks and their line of trailers flitted in and out and all over the pier with loads of materials for the booths, decorations and apparatus and supplies for the exhibitors. During the exposition they will pull the sightseeing trains of little passenger coaches up and down the board walk on the upper decks of the pier. When the exposition closes they will play a major part in removing the exhibits from the pier. This is an electrical feature of which the industry is very proud.

Nichols-Lintern Co., 8404 Lorain avenue, Cleveland; Space 20A; showing electric railway supplies.

Peoples Gas Co., Chicago; Spaces 3, 5 and 7; C. A. Luther in charge; showing a large line of household gas appliances, including ranges, water heaters, gas logs, etc.

Premier Service Co., 4556 Malden avenue, Chicago; (Representing the Electric Vacuum Cleaner Co., Cleveland) Space 35; H. U. Mann in charge; demonstrating the "Premier" vacuum cleaners and other electrical appliances.

Public Service Co. of Northern Illinois, 72 West Adams street, Chicago; Space 38; J. G. Learned in charge. This company will show a large relief map of the territory it supplies, together with statistical charts and public utility information.

Radio Corp. of America, 1599 St. Clair avenue, Cleveland; (Represented in Chicago by the Goodrich Transit Co.) Space 15; Park Robbins in charge; exhibiting radio apparatus and a model of the Goodrich Line *S.S. Alabama,* equipped with wireless installation.

Railway & Mine Supply Co., 332 South Michigan boulevard, Chicago; Space 33; D. G. James in charge. There will be displayed in this booth samples of the company's roller bearing trucks for coal and metal mines and other purposes.

Ross Carrier Co., Benton Harbor, Mich.; Space 20B. In this booth will be exhibited the company's industrial carrier, a type of electric truck designed to pick up and carry materials from one point to another in an industrial plant or warehouse.

L. Stauber Hardware Co., 3911 Lincoln street, Chicago; Space 8; William E. Stauber in charge. The company will demonstrate the complete line of clothes washers made by the Haag Co., Peoria, Ill., as well as the Hoover suction cleaner.

Stover Co., 1409 South Michigan avenue, Chicago; Space 10; A.M. Schulz in charge. This company will exhibit the "Frigidaire" electric refrigerator, made by the General Motors Co., and a farm lighting plant.

C. E. Sundberg & Co., 7738 South Halsted street, Chicago; Space 50; George L. Marx in charge. This company, operating a chain of

electrical appliance stores in Chicago, will demonstrate the "Apex" line of clothes washers and ironers made by the Apex Appliance Co., Chicago.

Superior Washing Machine Co., DeKalb, Ill.; Space 49; exhibiting and demonstrating the "Superior" washing machine.

Vaughn Co., 740 North Franklin street, Chicago; Space 4B.

Walker Vehicle Co., 8700 South State street, Chicago; Space 21; F. E. McCall in charge. This booth will contain a 1-ton electric truck with panel body—a truck suitable for bakery, laundry or similar delivery service—also one Walker axle display unit in actual operation. There will also be shown photographs of typical electric truck installations among nationally known users.

Western Electric Co., New York City; Spaces 26, 28, 30 and 32; D. H. Frick, Chicago sales manager; assisted by C. A. Wickstrom, from the New York offices, and a competent corps of demonstrators and salesmen, will have charge of this exhibit.

Among the features to be exhibited in this space is an automatic coil-winding machine, a special machine for making signal plug blanks for telephone switchboards and a Wardwell braiding machine for insulating wire and making telephone cords. There will be a complete still exhibit of the company's products, one of them showing all the processes in the manufacture of rubber mouthpieces from the crude rubber to the finished product. There will be a display of cables showing lead-covered cables and submarine telephone cables. In addition, there will be shown and demonstrated a complete line of the company's labor saving electrical household appliances and a farm lighting plant. The plants of this company are said to be the largest of their kind in the world. There will be shown photographs of the various departments in these plants. This will be one of the most interesting exhibits in the entire exposition.

Electrically Operated Demonstrations Surpass World's Fair.

Some of the electrically operated demonstrations in the Pageant of Progress exposition will surpass any ever attempted at the Chicago World's Fair or any of the other international expositions. Section W, adjoining the electrical appliance displays, is taken up entirely with a large commercial laundry in actual operation in all its departments. This is being handled by the Chicago Laundrymen's Association, most of the machinery being from the factories of the Troy and the American Laundry Machinery Cos.' This machinery is operated by 32-hp. motors.

In the booth of the Bagley Manufacturing Co., (T-9) there will be electrically operated blowers and exhaust fans, some of them direct connected and others with belt. A feature of the belt-connected fan and blower is a self-ventilating pulley with slipping surface. The tension of the belt is adjusted to the required speed but, because of the ventilating feature, the fabric of the belt is not burned or damaged by slipping.

The American Steam Pump Co., Chicago, will have a demonstration of a Nash vacuum pump, electrically operated.

In Section S-40, the State Labor Department of Illinois will have an electrically operated demonstration of factory protective devices in miniature; also a blower fan and a small protected printing press.

Much of interest electrically will be found in the large exhibit of the U. S. Navy at the east end of the pier. In addition to a large amount of electrically operated machinery, including turbines, etc., there are on display a number of Liberty, Hispano and Curtis gasoline motors for the airplane service.

Occupying a large space in the center of Section F will be found all of the machinery of a large dairy in full operation. This is the display of the Davis-Watkins Dairymen's Manufacturing Co., North Chicago, Ill., showing electrically operated pasteurizing plant, bottle washer, filler and capper.

In Section E-29 the Vilter Manufacturing Co. will have in operation a 7.5-ton refrigerating machine, electrically operated and supplying refrigeration to the Cincinnati Butchers' Supply Co. in an adjoining booth. Not far from this will be an electrically equipped dental parlor with appliances furnished by the Alexander Cassriel Co.

Electricity Used to Operate Large Packing Plant and Panorama.

In Section E the United Packers' Association, Chicago, has reproduced a packing plant in miniature, but sufficiently large to occupy space equal to a dozen booths. Every process, from the arrival of the cattle at the stock yards to the refrigeration of the meats, is shown in motion, animated by electricity.

Adjoining the exemplification of the packing industry is the unique exhibit of Swift & Co. A glass-paneled refrigerating car for transporting meats is shown fully stocked, the wheels are revolving upon the rails while a panoramic view of the country speeds by at the back, and other features increase the illusion of a swiftly moving car. A small motor furnishes the necessary motion.

The University of Illinois will occupy several booths and will give prominence to its engineering department with the aid of electrically operated models.

The American Flyer Manufacturing Co., Chicago, occupying C-31, has laid out in its booth a section of country with hills, valleys, streams and a tunnel. A miniature railroad track is laid through the territory, crossing over bridges and culverts, encountering signal stations and other features incident to a railroad right-of-way. An electrically propelled train will be in constant operation.

Mandel Bros., Chicago merchants, will feature in their display in Section C-24, 26, 40 and 42, electrically operated looms furnished by the Niagara Textile Co.

Lighting Effect in Jewelry Booth a Feature of Exposition.

In the same section with Mandel Bros. will be the brilliant display of C. D. Peacock, Chicago jeweler. A large dome surmounts this booth, from the center of which is suspended a

huge stone in imitation of a diamond. By the use of a rainbow flasher played upon the stone, a novel effect is produced. Electricity is also used in this display to operate a diamond cutting machine.

In Section B-35 there is an installation of shoe making and repairing machinery furnished by the American Shoe Machinery & Tool Co., St. Louis. These machines will be electrically operated, while experts will demonstrate the making of shoes.

The Addressograph Co., Chicago, has reserved a large space and will demonstrate the operation of its machines with the aid of electricity.

In the booth of E. L. Mansure (B-2 and 56), Chicago drapery manufacturer, there will be electrically operated looms, one of which will make various kinds of tape, others making fringes and other features of drapery.

The Dalton Adding Machine Co., in A-33, will demonstrate electrically operated adding machines; the Holeproof Hosiery Co., in C-37, will make hose by electricity, and the Boston Store, Chicago, will use electricity to operate a silk loom.

There are two paper box manufacturers in Section A, the Kroeck Paper Box Co. and the H. Schultz & Co. In both of these exhibits workmen and women will demonstrate box making with the aid of electrically operated machines and presses.

In Section C-11 and 13 the Kabo Corset Co. will employ electricity to operate sewing machines in the making of corsets of all sizes from doll corsets to those for the largest women.

Aside from the employment of electricity in the exposition its uses will be manifest throughout the entire city of Chicago during the 2 wks. of the Pageant of Progress exposition and festivities. Special illumination will be in evidence and members of the electrical industry will do their big share toward making visitors feel welcome.

OBSERVE EFFECTS OF ECLIPSE ON RADIO SIGNALS.

Increase Noted in Strength of Signals Received From Remote Stations, But Little Change Resulted in Short-Range Transmission.

An interesting description of the observed effects of an eclipse of the sun on radio communication appeared in a recent issue of *Radio Review*. The description covers observations made in England and Scotland, and is as follows:

"In order to observe if any abnormal phenomena were produced during the eclipse arrangements were made for a special watch to be kept at certain of the wireless stations under the control of the Post Office. The stations concerned were Wick, Stonehaven, Cullercoats, Caister, North Foreland, Niton, Lands End, Fishguard, Seaforth and Devizes.

"The total period of the eclipse, at Greenwich, was from 7:35 a. m. to 10:05 a. m. The maximum occurred there at 8:47 a. m. At other places the times of first and last contact and of maximum were different, but these differences were so small that as far as the observations recorded below are concerned they may be neglected.

"At most of the stations dealing with the ordinary ship-and-shore communication on 600 metres no change either in the strength of signals or in the strength or frequency of atmospherics was observed. At Fishguard (southwest coast), however, between 8:28 a. m. and 9:36 a. m., signals improved both in clearness and strength. This effect was more pronounced with the signals from distant stations than with those from nearer stations.

"At Wick (north of Scotland), although no unusual daytime ranges were observed, there was during the period of the eclipse a pronounced under-current of faint signals which is not normally present during the day.

"At Devizes (south of England) the conditions observed during the eclipse were practically identical with those usual during the night. With a receiver consisting of one high-frequency amplifier, a rectifying valve, and two note-magnifying valves, the average strength of signals from Warsaw during the day is 7. Warsaw works on a wavelength of 2100 metres, using spark transmission. During the eclipse these signals increased to maximum strength, which is the usual night condition, and after the eclipse they returned to their normal daylight strength.

"Devizes also observed an increase in the strength of signals received from various French military wireless stations. These stations were working on a wavelength of about 2000 metres, using continuous waves.

"An increase in atmospherics was observed at several stations during the eclipse.

"Before the eclipse atmospherics were practically absent at all the observing stations. At Fishguard slight atmospherics were observed between 8:20 a. m. and 9:36 a. m. At Devizes atmospherics came on at the commencement of the eclipse and ceased when the eclipse was over.

"At Wick atmospherics gradually became louder and more numerous during the eclipse till at about 8:56 a. m. there was a continuous crackle. This then decreased and after the eclipse the atmospherics disappeared.

"A similar growth in the number and strength of atmospherics was observed at Caister (east of England), and there also the atmospherics disappeared after the eclipse."

LIGHT AND POWER RATES FIXED.

Following a protest by the local Town Commission against the light and power rates of the Chestertown (Md.) Electric Light & Power Co., the Public Service Commission has handed down a decision establishing new reduced charges as follows: Commercial lighting, $0.19 and $0.20 per kw-hr.; power, $0.10 to $0.04 per kw-hr.; public street lighting, $21 per lamp per year. Bills are to be subject to a 5% cash discount for prompt payment.

I. A. M. E. TO MEET.

Announcement has been made by Clarence R. George, Houston, Tex., secretary of the International Association of Municipal Electricians, that the 26th annual convention of the Association will be held at Colorado Springs, Colo., Sept. 6-10.

The Precipitation of Suspended Particles in Mills

Value of Gases Escaping From Stacks—System Used for the Collection of Potash During the War—Scope of Process Broadened Until Its Use Pays Big Dividends as Well as Promoting Safety

Electrical precipitation of suspended particles in gases of cement stacks, for the recovery of potash, has been one of the great steps forward during the last decade. Not only is this true of cement plants, but the smoke, fume and dust arising in metallurgical, chemical and other industries has also presented a problem which had to be considered from the standpoint of conservation as well as that of preventing injury to plant life in the vicinity. With the increase in factories and chemical plants, this problem has pressed for a solution, both from the economical standpoint and because of the increasing seriousness of the pollution of the atmosphere.

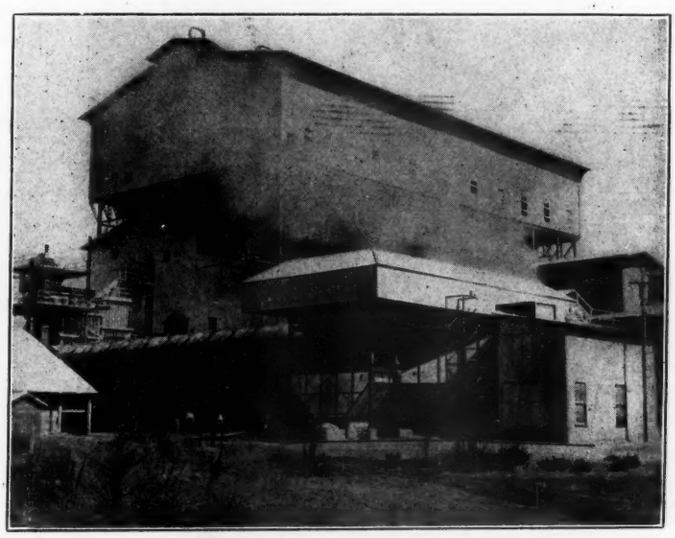


Fig. 1.—Cottrell Precipitator Installed at Riverside Portland Cement Co., Crestmore, Cal.

In very large measure these losses in many industries are represented by the values escaping with the dust and fume from the stacks, many of them being a few years ago considered unavoidable and incidental to the operation of the plants. The practice of eliminating such losses by removing the suspended particles from the gases and collecting the dust is becoming more general, principally by the electrical precipitation process.

Values of the collections in commercial installations represent large sums, running well into the millions of dollars. The scope of the process is being constantly broadened and new uses are being developed as new problems arise.

Electrical precipitation of suspended particles from gases is accomplished by passing the gases to be cleaned through a high potentional unidirectional electrical field, between two opposite charged electrodes, one of small area, called the discharge electrode, and the other of larger area, called the collecting electrode. The collection electrode is grounded, while the discharge electrode is insulated from it and is connected to a source of high potential unidirectional electricity. During the process of treatment, the individual suspended particles are electrically charged and are driven by the force of the electric field toward the collecting electrode and deposited thereon. The cleansed gases then pass on through the apparatus unaffected. The size and cost of installation depends on the gas volume, character of gases and special requirements which may be due to local conditions at the plant at which the installation is to be made.

The pipe precipitator is usually built of steel pipes, arranged vertically in groups or units. The length and diameter of the pipes may vary in different installations and either up or down draft may be employed. Tile, lead or wood pipes may be used, instead of steel, especially in plants where corrosive fumes are to be treated.

The plate type of precipitator may be constructed of lead or corrugated iron sheets or similar material. As in the pipe precipitator, the material is dependent on the character of the gases. Screens have been used as collecting electrodes. The discharge electrodes may consist of wires, chains, rods, etc., acid-resisting materials being used in case of corrosive gases. The precipitator building may be constructed of any suitable material.

The collected dust which does not fall by gravity into the hopper below the precipitator is dislodged from the electrodes by means of rapping devices which vibrate the electrode system.

To produce the high potential charge of the discharge electrodes, a unidirectional current of high velocity is necessary. Alternating current of low

voltage is stepped up to the desired voltage by means of a transformer and then converted into unidirectional current by means of a motor-driven high-tension mechanical rectifier.

A complete electrical unit consists of a motor-generator set, directly connected to the rectifier; a high potential transformer capable of delivering from 50,000 to 100,000 volts, and a switchboard and instruments. The required transformer voltage depends on the spacing between the discharge and collecting electrodes, the character of the gases, the dust concentration and various other factors. In certain cases where power conditions at a plant are favorable, synchronous motors may be used in place of the motor generator sets, the power then being taken directly from the factory line. The number of electrical units required depends on the size of the installation.

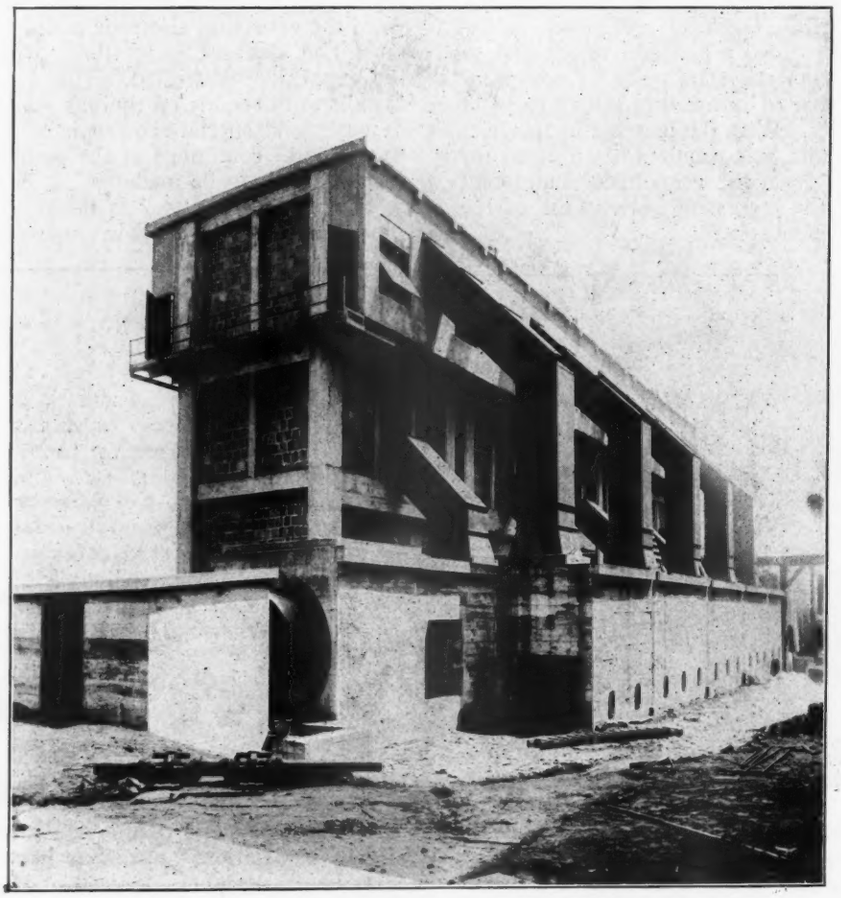


Fig. 2.—Installation at Dexter Portland Cement Co., Nazareth, Pa.

Factors Which Enter Into Consideration.

Composition and electrical conductivity of the gases, the nature of the suspended particles, the temperature, gas volume and many other factors must be taken into consideration when designing a plant to handle a specific problem. The presence of acids or other corrosive substances in the gases, for instance, determines the material to be used in the construction of the precipitator, as well as the types of electrodes to be employed.

Different gases have different characteristics and precipitation is influenced both by the nature and temperature of the gases and the nature and conditions of the deposited dust and fume. Humidification is occasionally necessary to secure proper conditioning of the gases for efficient precipitation and conducting materials may be added to the fume in order to secure proper conductivity.

Separation from the gases of substances having different volatilization or condensing temperatures may be effected by the use of fractional precipitation; that is, using precipitators in series, treating gases at different temperatures. In order to determine the type of precipitator for any special problem and to make a preliminary estimate and design, it is necessary to have complete information as to the character of the dust and fume, type of apparatus producing the gases to be treated, the temperature and volume of the gases, draft conditions, layout of flues and stack, electric power available, etc.

Frequently it is desirable to determine the dust losses and other necessary data concerning a proposed installation in order that accurate information may be available for designing a suitable precipitator. In cases of plants under construction, or to be constructed, existing information on similar plants in operation is used as basis for design.

Cement Plant Installations.

In an installation at the plant of the Riverside Portland Cement Co., Crestmore, Cal., in which Cottrell precipitators were installed by the Western Precipitation Co., Los Angeles, Cal., the main

installation was of the plate type, and was built as a superstructure as there was no available space in the plant. A view of this is shown in Fig. 1, in which the pipe precipitator shown in the lower center of the illustration was built to treat gases from additional kilns. Although this installation was built primarily for the abatement of the dust nuisance, the final result was the first plant for the recovery of potash from cement.

It was found that the collected dust contained an appreciable quantity of potash and could be used as a fertilizer. During the war the plant was operated at a good profit for the recovery of the potash from the dust collected by the precipitators. Methods were devised by the plant management for increasing the amount of potash in the dust and a leaching process was developed which produced a high grade potash salt, which had a ready sale in the fertilizer market.

In the installation, Fig. 2, at the plant of the Dexter Portland Cement Co., Nazareth, Pa., tile and concrete were used in construction of the building.

Figs. 3 and 4 illustrate the plant of the Asano Portland Cement Co., Tokyo, Japan, Fig. 3 showing the progress of the work. Gases from both lime and cement kilns are treated in separate precipitators. The lime kiln stacks were replaced by a common flue, through which the gases pass to the precipitator.

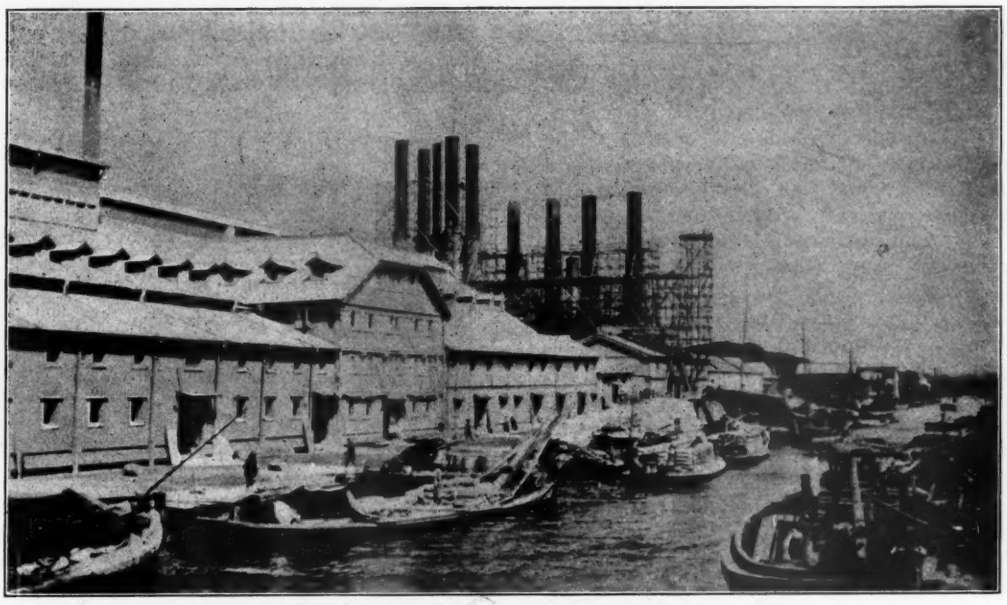


Fig. 3.—Installing a Precipitator at Asano Portland Cement Co., Tokyo, Japan.

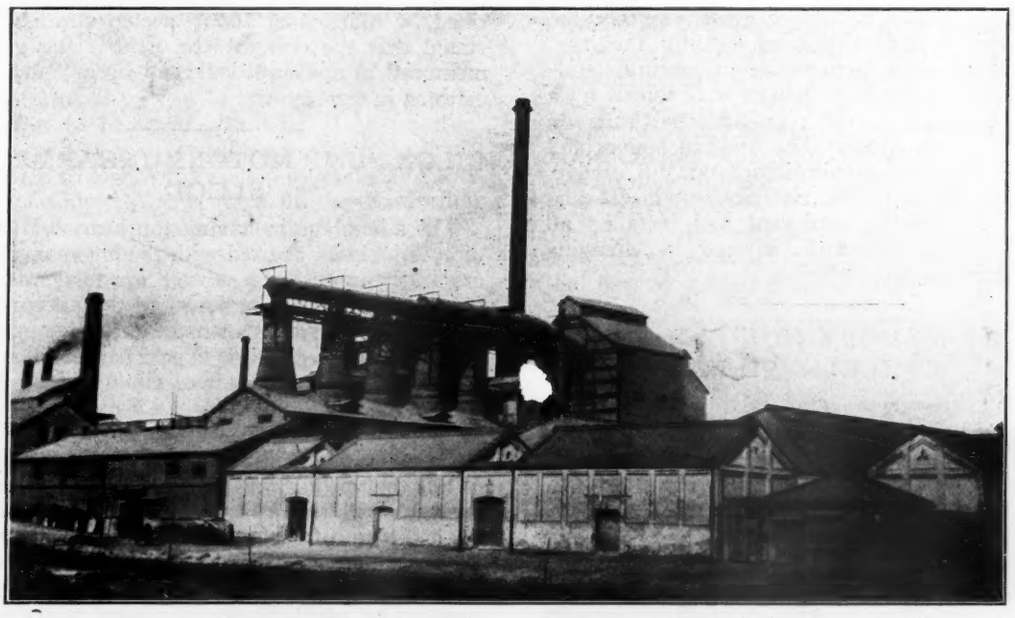


Fig. 4.—Showing the Lime Kiln Precipitators in Asano Plant at Tokyo, Japan.

Fig. 4 is a view of the completed flue of the Asano plant, showing the lime precipitator building and the stack when the precipitators were in operation. The problem at this plant was of

especial interest as the plant had been adjudged a nuisance by the officials of the district in which it was located and the company had been given until a certain date to either remove their plant or to show an efficiently operated dust collector system. The successful operation of the Cottrell precipitators practically saved the plant.

MOTOR REPLACES STEAM POWER ON HARBOR DREDGE.

The Puget Sound Bridge & Dredging Co., Seattle, Wash., recently completed the electrification of its steam harbor dredge, "Tacoma." The 20-in. centrifugal suction pump was equipped with a new runner, and was directly coupled to a General Electric 1000-hp., 2300-volt a-c. motor, giving the pump a capacity to handle 1200 cu. yds. of material per hour. The winding mechanism for raising and lowering the 75-ft. ladder that carries the cutter shaft and suction pipe is operated by a 150-hp., 440-volt motor, and another motor of 75-hp. capacity is required for operating the equipment by which the spuds and swinging cables are manipulated.

Central-station energy at 2300 volts is transmitted from a substation on shore by a submarine cable to the dredge where there are three Westinghouse 37.5-kv-a. transformers by which the voltage is stepped down to operate the smaller motors. The submarine cable, furnished by the Standard Underground Cable Co., is made up of three units of copper wires, insulated from each other with rubber, jute and lead, and the entire cable is wrapped with steel reinforcing, giving a weight of 18 lbs. per ft. A scow attached to the dredge boat contains a cable reel on which cable of sufficient length is carried to allow any necessary variation of distance from the shore at which the dredge may be operated.

Other electrical equipment installed comprises operating switches, resistance grids, the 1000-hp. motor control apparatus, and lighting facilities. The discharge pipe from the 20-in. pump extends to the stern of the boat where it is joined by a flexible coupling to the pipe line that runs on pontoons to the shore. The original boilers and steam auxiliaries remain intact on the dredge. Thompson & Castleton, electrical engineers and contractors, Seattle, furnished and installed all the electrical equipment required in changing from steam to electric drive.

HEROES' MEMORY HONORED BY BIG ATHLETIC FIELD.

To honor the memory of the 49 Western Electric men who died fighting for their country, the Western Electric Co. has presented to its employes a completely equipped 10-acre athletic field. It is located just to the west of the company's works near Chicago, and includes the area between 22d and 23rd strets and 49th and 50th avenues. More than 20,000 of the Western Electric's employes and their families participated in the dedicatory exercises. They marched from the factory to the new athletic field, led by a great part of the 4389 Western Electric workers who were in the service, and by several of the American Legion Posts of Chicago.

H. F. Albright, vice-president of the Western Electric Co., and superintendent of its great works, presented the field to the employes. Mr. Albright explained the part athletics play in supplying a big industry's people with the chance to get acquainted and to develop group spirit. He attributed the splendid spirit of co-operation which has always existed in the ranks of the Western Electric Co. to the great share outdoor exercises have had in its welfare programs.

The new field can accommodate several hundred competitors in simultaneous performances. It includes an 8-lap track with a straightaway of

New Athletic Field of Western Electric Co. at Hawthorne, Ill.

120 yds.; a depressed area containing 24,350 sq. ft. for basketball, soccer, lacrosse, and the various field events; and 22 tennis courts, finished with a surface of specially prepared stone dust that enables them to shed rain like a duck's back. The depressed area will be flooded in the winter to furnish a skating and hockey rink. There is also a baseball diamond with a grandstand for 2000 spectators. An ornamental iron fence with four convenient entrances surrounds the field. The parkway, outside it, is planted with 88 American elms. The interior of the memorial area is beautified by more than 1000 selected shrubs. It is stated that the new athletic field is the greatest memorial of its kind dedicated by any industrial concern in the country.

BILGE PUMP MOTORS UNHARMED BY FLOOD.

The advantage in having top heads of vertical motors inclosed as used with the Yeomans Brothers bilge pumps and sewage ejectors was illustrated recently by an instance that occurred in connection with a Yeomans duplex bilge pump installed in a large New York bank. The head room above the pumps was about 6 ft., whereas the pumps were built for an 8-ft. deep pit. A 3 by 3 ft. opening was made in the floor above the pumps to facilitate handling the equipment. While the opening was being cut through the concrete floor the motors and controls were covered by a thin muslin cloth to prevent dust and particles falling into them.

Directly above the installation was a sprinkler head. One night the masons failed to remove the cloth and during this time it caught fire, presumably from the self-starters, and the heat opened the sprinkler head, discharging about 5000 gals. of water on the motors and surrounding appliances. No damage was done to the motors so far as could be ascertained.

Application and Use of Immersion Electric Heaters

Many Industrial and Domestic Needs Supplied by Employment of Electrical Liquid Heaters of Immersion Type—Sizes of Units Required for Different Services—Insulation Used for Economy

By JOHN M. STRAIT

Industrial Heating Section, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

There are many industrial uses for electric immersion heaters; in fact, they can be applied almost any place where large quantities of water or liquids other than acids are to be heated. They are also used for the indirect melting of glue, paraffin, tar and other viscous substances. The indirect method of heating consists of heating a vessel of water containing a separate vessel into which the substance to be heated is placed. In addition, this type of heater may be used for generating steam at a maximum pressure of 15 lbs. gage for hospital sterilizers.

Bayonet immersion water heaters of the 4500 and 6000-watt rating usually consist of four flat copper tubes brazed into a brass pipe plug which serves as a mounting for the heater tubes and terminals. Each copper tube contains a slotted ribbon heating element. Heat is generated uniformly throughout the length of the tube, and the water or other liquid which circulates freely between the tubes absorbs the heat as fast as it is generated. The heaters are designed to operate when immersed in liquid and should not be operated when not totally immersed.

Installing Heaters Properly Is Essential to Good Operation.

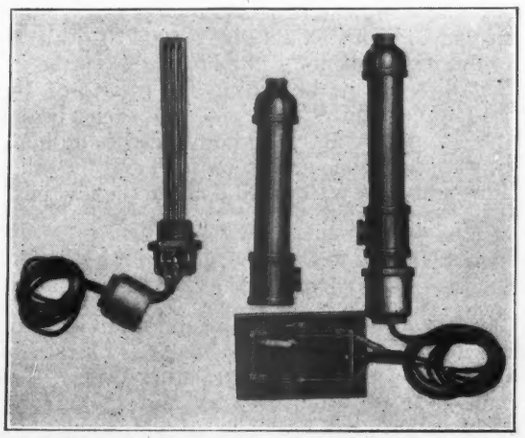
In installing the bayonet immersion heater in any apparatus there are certain principles which are always to be kept in mind. If the heater should ever be left in circuit when the water level has receded so low as to expose any portion of the heater tube above the surface of the water the heater will burn out in a very short time. It is of the utmost importance that the installation be made in such a way that it reduce to a minimum the danger of such an occurrence. In devices using circulating systems of water heating all piping should be arranged to insure free and unrestricted circulation, and there should be no valves which can be readily closed by inexperienced attendants. If possible, water-level indicators should be provided and properly marked with minimum indications.

When the heating elements are immersed directly in the water, projecting into the tank to be heated, the bayonet heater may be mounted in a horizontal position. When applied to hot water tanks or other devices in which it may be necessary to place the heater at the side or beneath the tank the heater should be mounted either in a vertical plane or at a sufficient angle to insure rapid circulation, with the terminal end of the heater at a lower level than the heater tubes. The pipes for circulating the water through the heater casing should be connected at the bottom of the tank so that there will be no danger of the level descending below either of them. This is a very important precaution because the circulation of water is necessary to remove the heat from the heating elements.

In heating large open tanks the heater can be installed so as to project across the bottom of the vessel, thus immersing the heater tubes directly in the water contained in the tank. The heater should be in the lower level in the vessel so that it will always be covered with water. If necessary a trough or groove may be carried across the bottom of the tank. In every case it should be remembered that the life of the electric heater depends upon its being covered with water whenever the current is turned on. For the most efficient and satisfactory operation of bayonet immersion heaters the tank or vessel and all the piping should be well lagged to prevent heat loss by radiation.

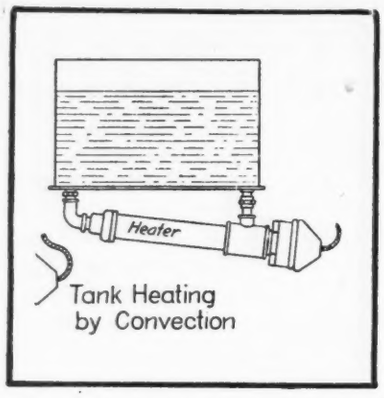
Determining Proper Size of Heater for a Given Service.

Determination of the proper size of bayonet immersion heater for any given application must be governed by the conditions to be met and requirements of the service, the time allowable for the initial heating up of the liquid being a factor in the size of the heater to be installed. The high heat or maximum position of the switch must be sufficient to bring the apparatus or the liquid to the desired temperature in the specified time, and in many cases it will be found that this involves a large capacity heater. It is necessary therefore to study the application in order to determine if a rapid heat at a high demand or a slow heat at a



Assembly View and Parts of an Immersion Liquid Heater.

low demand will best meet the requirements. The time required for heating can be reduced by reducing the quantity of water contained in the apparatus or vessel, and this can sometimes be done without affecting the success of the operation. For some classes of apparatus it is necessary to maintain a fixed temperature for a con-



Immersion Heater Installed to Heat by Connection.

siderable length of time after the initial heating up. In such cases the low-heat position of the switch is used.

As a typical example, it will be assumed that it is desired to heat 60 gals. of cleaning solution (nonacid) from an initial temperature of 60 deg. F. to a final temperature of 160 deg. F., the time allowed being 2.5 hrs. The tank will be assumed as being open and made of 0.25-in. cast iron, it being 2.5 ft. long by 2 ft. high. Its extension is rough and insulation is to be provided. Single-phase service is to be supplied at 220 volts.

Solution.—The 60 gals. of water weighs 500 lbs., and the rise in temperature is 100 deg. F., so a total of 50,000 B.t.u. will be required. This amount of heat would require 14.6 kw-hrs., or 5.85 kw. for 2.5 hrs. At 80% efficiency an input of 7.35 kw. would be required. Using a constant of 0.60 watts lost per deg. F. per sq. ft., the tank having approximately 25 sq. ft. of radiation surface, and the difference in temperature equal to 100 deg. F., the radiation losses are approximately 1000 watts. The 7.35 kw., plus 1 kw., equals 8.35 kw. for 2.5 hrs.

The assumption is also included that the customer will insulate the tank on the sides and bottom with 2 ins. of good insulating material. To meet the conditions as outlined two standard bayonet immersion heaters at 4500 watts each should be insulated. This would give a total of 9 kw. to meet the requirements. The heaters are to be installed directly in the tank. By means of the series-parallel knife switches on each heater wattage of 9000 watts with both switches on high, 5625 watts with one switch on high and the other on low, and 2250 watts with both on the low position are obtained.

Water Heating by Means of Immersion Equipment.

Capacity of heaters for any application is determined by (1) the weight of water, (2) rate of heating, and (3) radiation and other losses. The specific heat of water is 1.00, and 1 B.t.u., or 0.293 watt-hrs., will heat 1 lb. of water 1 deg. F., since 1 B.t.u. equals 0.293 watt-hrs. The input for heating of water only must be sufficient to deliver the total quantity of heat required in the time desired. This equals the total watt-hours required divided by the number or fraction of hours allowable for doing the heating. The maximum input of the heater must, therefore, be sufficient to heat up the water in the time required and supply the radiation losses.

LOSSES BY RADIATION FROM HOT-WATER TANKS.

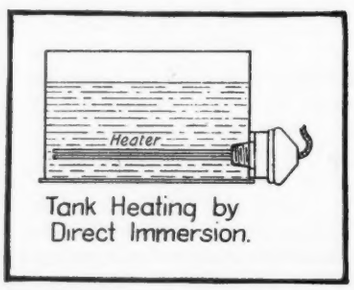
Character of surface of tank.	Watts lost per deg. F., per sq. ft.	Watts lost per 30-gal. tank, per deg. F.
Rough iron	0.80	13.8
Polished copper or nickel	0.58	10.0
Rough iron, well lagged, 2 in. thick	0.20	3.5
A 30-gal. tank has approximately 17.2 sq. ft. (wrought iron poorly lagged)	0.50	8.6

General information is often required as to the temperatures of water for various purposes. Accompanying data pertaining to this must necessarily vary somewhat with different individuals, but will serve as a guide in determining the amount of heat to allow for heating the water for such purposes:

TEMPERATURE REQUIRED FOR VARIOUS USES OF HOT WATER.

	Temperature, deg. F.
Bath	95
Hands, average	104
Hands, maximum	113
Face	99
Luke warm	86
Temperature of water in boiling	160

Temperature drop of 5 or 10 deg. may be obtained in a relatively short length of pipe. In order to reduce the loss to a minimum hot-water pipes should be lagged to retain the heat, this making it unnecessary to drain off a large quantity of water before water of sufficient warmth reaches the user. To the amount of hot water at boiler temperature used there will be added at least an equal amount of cold water. Consequently, in determining the quantity of water re-



Heater Installed Directly in Tank of Water.

quired for a given purpose it must be borne in mind that the quantity of water actually heated may be considerably less than the total amount required for use, since it is heated initially to a much higher temperature than that actually required in order to get a great quantity of heat stored in a relatively small space.

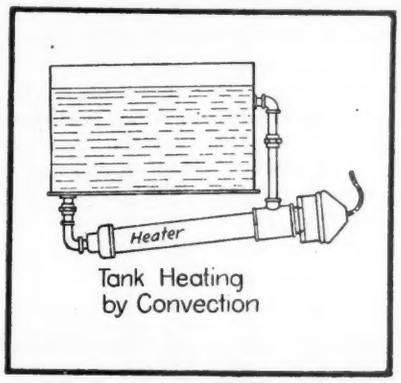
For the determination of the amount of power needed for heating a given quantity of water the following information is required: (1) Capacity of tank or pounds of water to be heated; (2) time required for heating water from the temperature of water entering tank to maximum temperature desired; (3) temperature of water entering tank; (4) temperature of water leaving tank; (5) if tank is insulated, the thickness and kind of insulation, and (6) power service available.

The power requirements, as listed in the accompanying table, are based on the following assumptions: The initial temperature of the water is 60 deg. F., and the final temperature is 160 deg. F. A total time of 2.5 hrs. is allowed for heating, 2 ins. of insulation being provided over a rough iron tank.

TABLE SHOWING WATTS CAPACITY REQUIRED FOR TANKS OF VARIOUS SIZES.

Boiler capacity in gals.	Boiler capacity in lbs. of water.	Watts required with insulated tank.	Watts required with uninsulated tank.
18	150	2,070	2,940
21	175	2,420	3,430
24	200	2,760	3,920
27	225	3,100	4,400
30	250	3,450	4.900
35	292	4,030	5,730
40	334	4,600	6,550
48	400	5,500	7,850
63	525	7,250	10,300
82	685	9,450	13,400
100	833	11,500	16,300
120	1,000	13,800	19,600
144	1,200	16,600	23,600
168	1,400	19,400	27,500
192	1,600	22,100	31,400

Another table suggests the size of heater that is required for various sizes of boilers when uninsulated and when completely insulated, including the piping. It is assumed that 10 gals. of water are used per day, and that the heater is on the circuit continually. The water is assumed to



Immersion Heater Installed With Circulating Pipe.

enter the boiler at 60 deg. F. and to be drawn off at 160 deg. F. The size of heater for any other rate of consumption can be determined by allowing 10 watts additional for each addition gallon used per day. It should be understood that these figures will have to be increased when comparatively large quantities of water are drawn off at short intervals. The next larger standard heater should be used in such a case.

TABLE SHOWING HEATER CAPACITIES SUGGESTED FOR VARIOUS TANKS.

Capacity of boiler in gals.	Uninsulated galvanized boiler and piping.	Boiler insulated with 2-in. covering and piping with 1-in. cover.
12	550	200
21	600	240
24	650	260
27	700	280
30	775	300
35	850	320
40	900	340
63	950	360

The precautions which have been enumerated above when making an installation may be summarized as follows:

(1) The current should never be turned on when the water level is below the highest point of the heater in case the heater is installed directly in the tank. If the heater is installed in a circulating system the level of the water should never be permitted below the opening of either pipe.

(2) It must be impossible to interfere, by the closing of valves or clogging of pipes at any time, with the circulation of the water through the heater casing.

(3) The heater must be installed so that the terminals and lead-in wires are protected from the danger of becoming wet from any cause. This may happen from leaking joints, drips from the overflow, and splash from the operation.

(4) All pipe connections and other joints should be absolutely water tight to prevent leakage.

(5) If a water gage is used its lowest point should be considerably below the heater, so that there will be no danger of misleading indications.

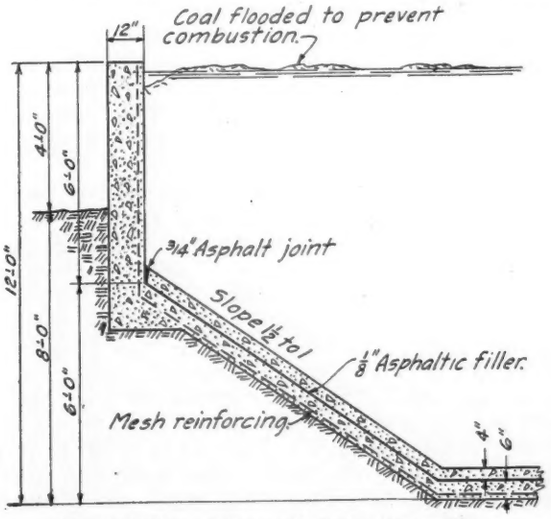
(6) Pilot lights are desirable to indicate when the current is turned on the heaters.

CONCRETE PITS FOR SUBMERGING RESERVE COAL SUPPLY.

Dangers of Spontaneous Combustion Are Eliminated and Drippage Basin Is Provided by Means of Which Screenings Are Saved.

The Great Western Sugar Co., at its Ft. Collins, Colo., plant, has made extensive use of concrete in the construction of a permanent pit to store its reserve coal supply and a smaller drippage pit for the reclamation of coal screenings. By flooding the pit danger of spontaneous combustion in the coal is eliminated, while the drippage pit recovers many tons of coal every year. Concrete construction was chosen as being best adapted to fulfilling all requirements for structures of this kind.

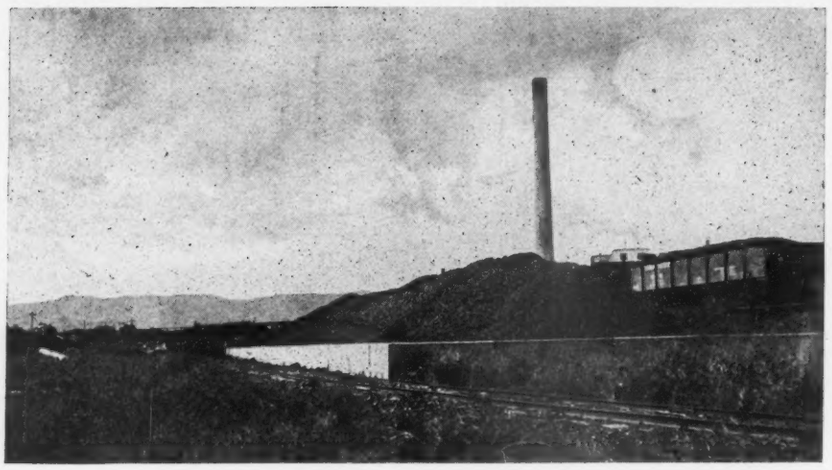
This pit was built in 1912. It is 250 ft. long,



Cross-Section of Concrete Coal Storage Pit.

150 ft. wide and 12 ft. deep, and extends 8 ft. below ground level. The capacity is 7000 tons. The side walls are 6 ft. deep and 12 ins. thick and extend 2 ft. below the ground surface to join a floor 6 ins. thick with an inward slope of 1½ to 1 to a depth of 6 ft. This sloping side floor joins the main 6-in. bottom floor of the pit. Both floors are reinforced with rectangular mesh steel. Expansion joints are placed every 10 ft. through the walls and at regular intervals in the side and bottom floors.

An additional 4 ins. of plain concrete was placed over the side and bottom floors with an asphaltic filler between the 4 and 6-in. sections.



This Concrete Coal Storage Pit Permits Flooding of the Reserve Coal Supply and Eliminates the Danger of Spontaneous Combustion.

Expansion joints in the floor slabs are staggered with respect to each other and to those in the side walls. An asphalt joint ¾ in. thick is placed between the edge of the upper floor slab and the side wall. The two floor sections are joined by 1 by 6-in. sq. steel pins which were embedded vertically near the center of the respective slabs during construction.

Coal is dumped into the pit from railroad cars spotted on a center trestle. The pit is then filled with water to the top of the walls. Additional coal for immediate use is piled on top of the submerged coal already in the pit.

Although the storage pit has been in continuous service for 8 years, it has required practically no maintenance. Its present condition indicates that it will give unlimited years of service.

The coal drippage pit is 60 ft. long and 40 ft. wide, evenly subdivided lengthwise by a 12-in. concrete wall of the same type of construction as the four outside retaining walls. This permits the removal of coal from one-half of the pit while the other half is being filled.

Before entering the furnaces, the coal is mechanically placed upon revolving grates, some screenings passing through the grate bars up to the entrance to the fire box. These screenings fall upon an inclined steel plate and slide into a ditch containing running water, passing in front of the furnace. The screenings are then pumped from this ditch into the drippage pits through a 6-in. iron pipe. The water is drained from the pits through a release gate in each compartment, a perforated iron plate preventing the coal from passing out with the water. The screenings are then removed by a clam-shell steam shovel and deposited in industrial railway tram cars and conveyed to the main hopper which feeds all furnaces. Frequently the screenings are mixed with fresh coal before being dumped into the hopper.

This drippage pit was installed during the summer of 1919. It was successfully operated during the entire season that year. Many tons of coal, which would otherwise have been wasted, were reclaimed, and the saving involved has more than justified the expense of construction.

PERMEABILITY OF CONCRETE.

Some preliminary tests have been made by the Bureau of Standards of a new apparatus for determining the rate of penetration of water through concrete and other permeable materials. The apparatus is so constructed that it is not necessary to mold the test piece in any particular shape, but any slab having one fairly smooth face may be tested. Only a few seconds are required for placing and adjusting the test specimen. This will permit specimens to be cut from walls or other portions of structures for tests. Tests so far made, while more in the nature of a try-out of the apparatus than the materials used, have furnished some rather interesting results.

In the following table the results of tests on samples of building stones from various quarries, as well as on some mortar and concrete specimens, are shown. The specimens varied from 1¼ to 2½ ins. in thickness and pressure was applied over an area of 25 sq. ins.

Test specimen.	Absorption in 24 hrs., %	Thickness, ins.	Water pressure, lbs.	Time required for penetration through wall.
Limestone	5.80	1⅝	60	10½ minutes
Limestone	3.10	1 5/16	60	11 minutes
Limestone	4.40	1⅝	60	19 minutes
Limestone	4.60	1⅝	60	2⅔ minutes
Limestone	3.81	1⅝	60	20 seconds
Limestone	3.48	1¼	60	1½ minutes
Sandstone	5.56	2½	60	10 seconds
1:6 portland cement mortar	7.8	2	60	3½ hours
1:1½:2 concrete	5.8	2	60	Did not fall in 24 hrs. when broken through water had penetrated only ½ in.

These results appear to bear out conclusions previously drawn in the Bureau's investigation of the durability of concrete in alkali soils that there is no apparent relation between absorption and permeability.

While considerable work must be done to standardize the method of making the permeability tests, it appears that this apparatus will assist in studying with a minimum of effort an important characteristic of concretes which has in the past been generally ignored, due to lack of suitable apparatus.

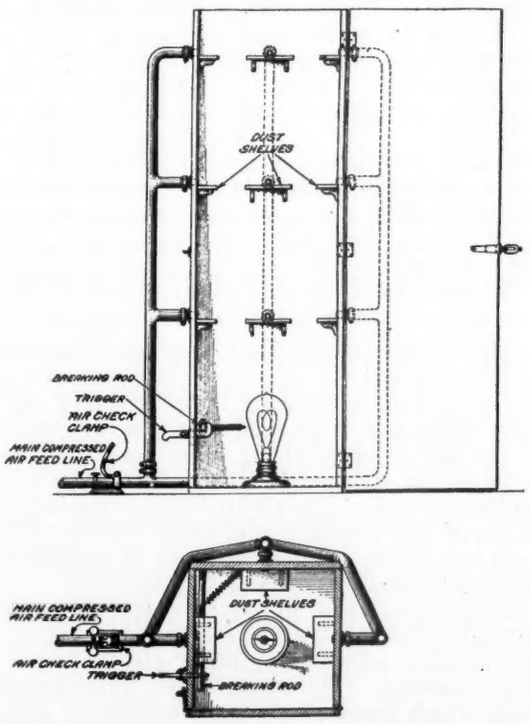
At a recent meeting the Swiss Federal Railway Administration approved the buying of 32 electric locomotives, according to Consul Thornwell Haynes at Berne. A credit of 24,000,000 francs, chargeable to the 1921-1923 construction account, was voted for this purpose.

Incandescent Lamps Used in Dust-Laden Atmosphere

Electric Lamps Provide the Safest Known Form of Illumination—Precautions Required Guard Against Fire and Explosion—Tests Conducted by the Government to Determine Actual Conditions

By D. J. PRICE and H. R. BROWN
United States Bureau of Chemistry, Washington, D. C.

Improper installation and inadequate protection of incandescent lamps constitute a fire and dust-explosion hazard in dusty industries. In the investigation of many grain-dust explosions and fires in this country and Canada by the Bureau of Chemistry of the U. S. Department of Agriculture the evidence obtained indicated that faulty electrical installations were responsible for the original ignition of the dust, although in some cases it was impossible to establish definitely the cause of the disaster. Sometimes the explosion occurred while an electric lamp on a cord was being lowered into a bin. Again, the fire which caused the explosion apparently originated on the floor of the plant in piles of dust directly below electric lamps suspended from the ceiling by drop cords.



Explosion Chamber Used to Test Lamps in Dusty Atmosphere.

It was known that fires could be readily started by burying an electric lamp in dust. During tests conducted at the Pittsburgh station of the U. S. Bureau of Mines a 32-candlepower electric lamp was placed in a box of fine coal dust, and in less than 30 min. the bulb had burst and the coal dust was found to be on fire. Following this experiment a 16-candlepower electric lamp was placed in a nail keg half filled with Pittsburgh coal dust, and 18 min. later small puffs of smoke issued from the keg, and at the end of 32 min. the dust smoked steadily continuing to burn even after the lamp had been removed. As a result of these tests it was concluded that possibly dust explosion could be started by the breaking of an incandescent lamp in a dust cloud or by the ignition of dust which had settled on the lamp.

During the dust-explosion-prevention campaign conducted by the U. S. Department of Agriculture and the United States Grain Corp. the men who visited the mills and elevators endeavored to obtain all possible information on this subject. About 20 cases were reported where the explosion or fire was supposed to have been started by the ignition of dust which had settled on the lamp or by the accidental breaking of an electric lamp in a dusty atmosphere.

According to the manager of a northwestern elevator, the dust which has collected on electric lamps often smolders and smokes and sometimes ignites and glows. He stated further that the dust coating on the globe had been known to take fire and drop to the floor, igniting dust there. It is interesting also to note the experiences of an elevator company as reported in one of the journals devoted to fire protection. Three fires started in this plant within 5 ft. of one another at intervals of 1 hr. As various theories concerning the origin of the fire were advanced a detailed investigation was undertaken. It was found that the fires were caused by the collection of wheat dust on ordinary incandescent lamps. Apparently the dust was ignited by the heat of the globe and fell to the floor, where it set fire to dust. The trouble was remedied by the installation of double globes on the lamps.

As many still thought it impossible to start an explosion in this way, and as it was difficult to obtain the actual proof of such cases reported to have occurred in industrial plants, it was decided to conduct experiments in which the conditions would be the same as those in factories where the hazard was supposed to exist. As the lamp manufacturers were equipped to conduct such experiments the Bureau of Chemistry prepared an outline of the testing work to be done and arranged to have the investigations conducted in the laboratories of one of the large lamp companies.

Previous tests made by the Bureau of Chemistry had proved that practically all combustible

TABLE NO. 1.—SMOKING, MELTING AND IGNITION TEMPERATURES OF CARBONACEOUS DUSTS.

Name of dust.	Smoking temperature Deg. F.	Smoking temperature Deg. C.	Melting temperature Deg. F.	Melting temperature Deg. C.	Ignition temperature Deg. F.	Ignition temperature Deg. C.	Difference between smoking and ignition temperatures Deg. F.	Difference between smoking and ignition temperatures Deg. C.
Sample 2b	288	142	...	...	511	266	233	124
Sample 1c	331	166	...	...	513	267	182	101
Sample 4d	295	146	...	...	532	278	237	132
Sample 3e	298	148	...	...	536	280	238	132
Cocoa	313	156	...	...	558	292	245	136
Graham flour	309	154	552	289	883	473	574	319
Cornstarch	284	140	545	285	891	477	607	337
White wheat flour	315	157	507	264	919	493	604	336
Corn meal	311	155	527	275	934	501	623	346

(a) Melting temperature is considered to be the point at which the dust congeals.
(b) Approximately 22% oats, 20% durum, 40% winter wheat, 10% hard winter wheat, 10% miscellaneous.
(c) Durum wheat dust.
(d) Approximately 40% winter wheat, 35% barley, 25% oats.
(e) Approximately 60% oats, 35% winter wheat, 5% rye.

dusts when in suspension in air form an explosive mixture which can be ignited by an electric arc or by static electricity. The question to be determined, then, was this: Will the exposed filament in a broken electric lamp remain hot long enough after the globe is broken to ignite the surrounding dust cloud?

To determine this a series of tests were made in an explosion chamber constructed according to the diagram shown in the accompanying illustration. A socket to hold lamps of various sizes was placed in the bottom of the chamber, and a rod with a trigger release was arranged to smash the lamp when a dust cloud had been formed in the chamber. The cloud was produced by blowing dust from small shelves along the side of the chamber. As this dust settled the trigger was pulled and the rod, springing back to its normal position, broke the globe.

Explosions were obtained with both vacuum and gas-filled lamps. The only exception was with the vacuum tungsten and carbon lamps of very low wattage. The failure to obtain an explosion with them was due, probably, to the character of the dust cloud and the manner in which the lamps were broken. Dust explosions and fires, therefore, can be caused by the breaking of an electric lamp in a dust cloud.

In tests made to ascertain the danger due to the ignition of the dust on the globe more extensive investigations were necessary. Temperature reading of the various types of vacuum and gas-filled lamps on the market were prepared with the ignition temperatures of the various dusts found in industrial plants. Tables No. 1 and No. 2 give the temperature readings for representative types of lamps, as well as the smoking, melting, and ignition temperatures of various dusts. It will be noted that the temperatures of the dust must be raised at least 150 deg. F. above the maximum temperature of the bulb to cause ignition.

In an especially constructed chamber in which a continuous dust cloud may be maintained it has been possible to start a fire on the larger gas-filled lamps with each of the first four samples listed in Table No. 1. The ignition of these dusts is probably due to the fact that the very chaffy dusts collect on the globe where they form a blanket which prevents radiation of the heat generated in the lamp and raises the temperature of the bulb to the ignition temperature of the dust. Some dusts seem to melt or congeal and form a crust on the globe which does not burn readily. Other dusts apparently do not form a blanket heavy enough to cause the temperature of the bulb to rise to the ignition temperature of the dust. It is believed, however, that any combustible dust, if allowed to collect on the lamp in sufficiently thick layers and remain long enough, will ignite. Under ordinary conditions with the small lamps commonly used in our industrial plants, and with free circulation of air around the globe, it is thought unlikely that a fire will be readily started in this way. It is, however, a hazard which should be guarded against.

An investigation of the methods employed in the lighting of mills and grain elevators for the purpose of determining equipment which can be safely used, and the amount of illumination required, is now being made. At present it appears that many of the dangerous practices, such as the use of open wiring, drop cords, unprotected lights, etc., can be eliminated by modern lighting methods. The electric lamp is the safest source of light available, and the hazard involved in its use in dusty atmospheres can be eliminated by proper installation and protection.

All electric lamps in places where explosive dusts are present should be equipped with vapor-proof globes, protected by heavy guards to prevent breakage. The straight-side vapor-proof globe which prevents the accumulation of dust on the lamp may be used to maintain a temperature below the smoking temperature of the dust, provided it is the proper size for the lamp it is designed to protect. The use of drop cords and the so-called extension lights or portable lamps on long cords is probably the most common objectionable practice and should be eliminated as far as possible.

The removal of fire and explosion hazards depends upon the co-operation of the mill and elevator operators. When properly used the incandescent lamp is the safest form of illumination.

TABLE NO. 2.—AVERAGE TEMPERATURES OF BARE LAMP BULBS.

Type of lamp.	Max. bulb temperature Deg. F.	Max. bulb temperature Deg. C.	Temperature opposite filament Deg. F.	Temperature opposite filament Deg. C.
Vacuum:				
50-watt	153	67	153	67
100-watt	152	67	152	67
150-watt	157	69	156	69
Gas-filled:				
75-watt	245	118	180	82
100-watt	259	126	178	81
150-watt	338	170	222	106
200-watt	327	164	222	106
300-watt	294	146	229	109

Note.—Following conclusions are drawn from data in Table Nos. 1 and 2:
Ignition temperatures, extra chaffy dusts—511 to 558 deg. F. (266 to 292 deg. C.).
Ignition temperatures, other dusts—883 to 934 deg. F. (473 to 501 deg. C.).
Dust therefore must be raised over 150 deg. F. (83 deg. C.) to cause ignition.

Chicago's Pageant of Progress

By WILLIAM HALE THOMPSON, *Mayor*

After every great action comes reaction. For the past 4 years we have had great action in business and great stimulation of prices. Now we are getting the reaction, which history shows always follows action.

Industries throughout the country began marking time. Many of them are still marking time. It is not altogether their fault. Industry needs leaders right now. The big-visioned, forethoughted leaders of commerce recognized that it was necessary to stop marking time, hedging and waiting to see what the other fellow was going to do.

It is for this reason that the business interests of Chicago and the country generally have cooperated so enthusiastically in the development of the Pageant of Progress Exposition. These leaders know that delay in industrial activity means valuable time lost. They know, too, that some unusual stimulus must be given business to create the demand essential for renewed prosperity.

Chicago, the great central market of the nation, is taking the lead in bringing every encouragement in her power to bear upon the revival of industry. From July 30 to Aug. 14 there will be held on our magnificent $5,000,000 Municipal Pier an exposition that will be a guiding star to all industry. It will mean a pledge of business faith to the entire nation.

Starting as a Chicago venture, it quickly grew with giant strides into a national affair as manufacturers from all over the country became interested and enthusiastic over the opportunities offered by the exposition. Now, however, the scope of the exposition has surpassed even our first glowing hopes, as it has become an international affair. The Pan-American Consular Association, representing 21 Latin-American countries, has unanimously voted to join in the Pageant of Progress with exhibits. Acting as their adviser, the U. S. Bureau of Foreign and Domestic Commerce is now assisting in the planning of their displays, which will include rubber, coffee, sugar, hides, tropical woods and other raw products.

The consuls will act as hosts to visitors, each day a different country assuming the duties of welcome. Information regarding their markets will be available to our manufacturers attending the exposition, and suggestions will be made as to the cheapest and most direct ways for our manufacturers to ship goods to the various countries. The consuls will also tell of the special needs of each country so that American firms will have a wonderful opportunity of retaining the business which they have built up during the past 5 years. When it is realized that the volume of commerce with the Central and South American countries amounted to $3,256,000,000 in 1920 alone, the splendid chance available to industry in the United States can readily be seen.

There will be over 3½ miles of exhibits at the Pageant of Progress Exposition, these exhibits showing the history of many important American industries from their earliest beginnings to the present day.

The huge Municipal Pier, the largest exposition building in the world, extending 3000 ft. into Lake Michigan, will stage the most remarkable industrial and educational exposition ever held in this country.

The automotive sections will illustrate the history of transportation, from the ox-cart to airplanes and expensively fitted-out passenger dirigibles.

The automobile show section of the exposition will occupy greater space than the annual event at the Coliseum, and the range of exhibits will rival any display of motor cars and accessories heretofore held in the country. Due to the season of the year, the attendance of motorists from all over the country is assured. A daily demonstration on Chicago's magnificent boulevard system will augment the visual display.

In similar fashion a comprehensive exhibit of airplanes will focus the attention of the hundreds of people who are interested in the science of aviation, either as onlookers or prospective purchasers. The newest ideas in construction and equipment will be exhibited for their edification.

Nor will the important fact of public safety be overlooked. There will be several interesting features in this division.

Electricity, the motivating force of modern industry, will be shown in all its vast variety of applications. One sub-section of six booths will be devoted to the miniature representation of electric transportation in its entirety. On the floor space of the section there will be full sized electric vehicles, including a large truck, a tractor, a coupe, an industrial truck of the type used in factories, a mining locomotive and probably a street car.

Directly above these exhibits will be a panoramic painting 120 ft. in length, showing some scenes along the right of way of the Elevated and North Shore Electric roads, with a tiny model train in constant operation along the pictured track. Above this painting there will be a second painting. This will have scenes taken from along the right of way of some transcontinental railroad which has been electrified in part. This painting will show miniature power houses, waterfalls and tunnels, and there will be several model electric trains which run along the route and through the tunnels, which will operate continuously.

The story of lighting will be told in an interesting fashion, and several surprising exhibits will be shown to illustrate the remarkable changes which take place due to lighting effects.

These are just some of the many exhibits which are being planned and arranged for the Pageant of Progress—a great industrial educational exposition which will bring untold visitors to our city, produce a greater demand for our goods, make for better co-operation between buyer and seller, and inaugurate the much desired stimulation of production and sales.

NOW ROLL UP YOUR SLEEVES AND HUSTLE FOR BUSINESS!

Real Salesmanship Has Been Taking a Rest During Past Few Years—New Period Demands New Treatment in Electrical Trade.

By John MacIntyre,
The Society for Electrical Development, Inc.

This means you, Mr. Man in the electrical industry—all branches! All achievements that have helped to build up mankind have been the result of deliberate research and of continuous, hard, mental or physical effort intelligently applied.

During the past few years it did not much matter what you produced or had for sale, or what you charged for it—it sold. We all played much and spent generously. But such a condition could not continue. Our selling muscles got flabby and then the "public" took a wallop at us and all but knocked us out. But, fortunately, most of us were able to scramble to our feet before the count of "ten," we hung on the ropes awhile and now are ready to start training again. Let us see what problem is facing us—what we must train for.

As we see it, we must find markets for our production in order that our factories and transportation systems may keep their hundreds of thousands of employes busy instead of having to lay them off, thus stopping not only human production but millions of dollars' worth of modern productive machinery and crippling and holding idle millions of capital, thereby incurring losses which can never be made up.

Never has American capital in manufacturing fields been confronted with such problems as it is faced with today. Our home market is weak; in time it will recover, but now is the time for our manufacturers to reach out and at least secure a sound footing in the great markets of the world, thus preparing for the future growth of our industries whose production must be in part absorbed by exportation to foreign markets.

But Europe is broke, Asia is sick and South America is doubtful. What does this mean? We know that Europe in the main is peopled by honest, sincere, hard-working people who are producers in the face of conditions that, at best, are not nearly equal to conditions in America. South America and Asia are rich in natural resources and raw materials but short in cash for circulation. They have been trained and accustomed to do their trading on a long-time payment basis. They need us now, they need our product, but they cannot pay cash for it—they must have credit. Let us help to put our manufacturers in a position to extend that credit which is so much needed.

You do not believe it? Listen. The Hon. Austen Chamberlain, chancellor of the British exchequer, said last December to the members of the British Parliament: "Beside Great Britain, Denmark is the only country in Europe paying her way." In a recent issue of the *Wall Street Magazine* there appeared a statement by J. DeSousa Leao, of the Brazilian embassy: "Brazil will emerge safely * * * providing only that she be given * * * credits enough to meet the present situation."

Again, the basic branches of our own industry, our electric transportation systems, our central stations upon which the coming prosperity and industrial security of this country will in the future have to depend more than ever, must be aided by both cash and credit *now*.

What is the answer? Work! Save! Invest!

Commercial wealth is created by industry. Industry is the application of the intelligent thought, executive skill and physical or manual labor of the individual transforming to the use and comfort of mankind the natural wealth of the land or the raw materials obtained therefrom. In addition to which by development, the worker adds to the wealth of nations by the production of purely materialistic objects which may be employed for individual consumption and the satisfaction of personal needs or as instruments of further production. All this production must find distribution and so be exchanged in order that there may be either consumption or further useful application of same, in order to complete the circle. In brief, *Industry Is Work*—either physical or mental, or both combined.

As work or industry is the first element in production, so saving is the first step in capital for the individual, and the more capital there is invested in the production and distribution fields, the greater are the opportunities for employment and additional saving.

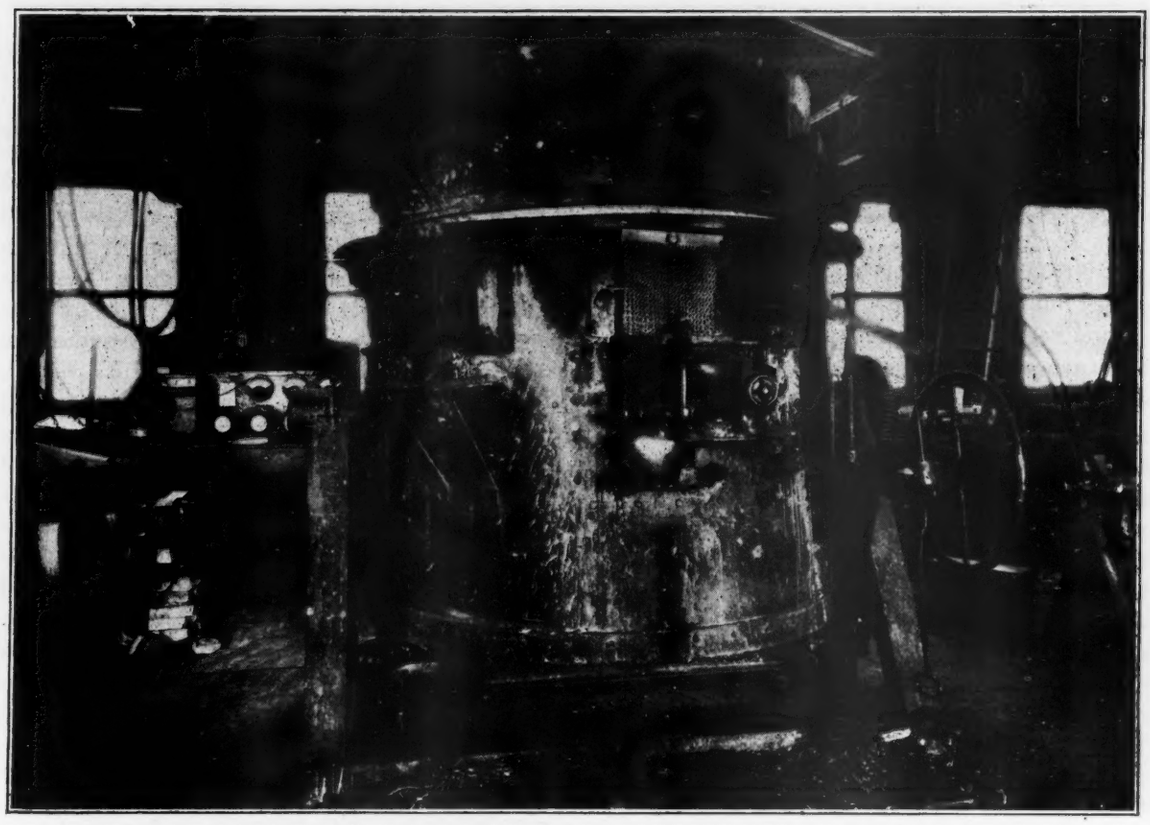
Therefore work, save and invest, first in the branches of the industry in which you are engaged, in order that you may add to the security not only of your investment of money, but of that capital which is purely your personal property, your labor. In doing this the wheels of progress will carry us onward and outward. Because of this co-operation of individuals giving *Service*, we will be able to do our proper share in the upbuilding not only of our own industry, but of our country.

Because we are a nation of workers—true producers—we will be able not only to sell for cash, but also to extend credit. In that manner we will give the other fellow the chance and encouragement he may need in order to bring himself to our plane, or as near to it as his ability and application will permit.

ORIGINAL COST BASIS OF UTILITY VALUE.

The State Railroad Commission of Wisconsin recently handed down an important decision in a case of the city of Superior and the Superior Light, Heat & Power Co., covering the purchase of the utility by the municipality, which has been pending since the affirmative vote of citizens in 1919. At that time the amount to be paid, it was arranged, should be the valuation set by the Commission. The company has asked $1,650,000 for the property, and the city, under certain contentions, offered $1,050,000. The Commission in upholding the city fixes the value at the last amount and lays down the rule that present market value will not be the guiding consideration in establishing the values of public utilities in the state, but that the original cost of property will be accorded the most consideration.

Good lighting brings increased business, greater civic pride, less crime and new industries to every progressive community.



Baily Electric Furnace of 1-Ton Capacity in Which Pig Iron Is Being Held in Molten Condition.

TEST SHOWS LITTLE VARIATION OF METAL IN ELECTRIC FURNACE.

Metal Remains in Molten Furnace for 24 Hrs. Without Material Change in Its Chemical Composition—Result of Recent Test.

From a metallurgical viewpoint the electric furnace presents many advantages over other types of metal-melting equipment. A recent test conducted with a Baily furnace shows a remarkable lack of variation in the composition of the material remaining in the furnace in a molten condition for a period of 24 hrs.

The furnace used was one of the standard 105-kw. Baily electric melting furnaces. For this test a clay hearth was provided, and the standard resistor troughs were used, and also the usual tilting gear. The diameter of this furnace is 7 ft. and its maximum capacity 1 ton of metal.

It is to be noted that by the use of furnaces of this type not only is a smaller foundry floor required, as the charging and drawing of metal can be done almost continuously, but borings which heretofore could not be handled readily in any other type of furnace can be economically melted. In the average machine shop foundry there is always a considerable quantity of borings available which must be sold at a low price, oftentimes for an amount scarcely enough to pay for the freight involved. By melting this material in an electric furnace it can have almost the value of new metal. In a similar way, but to a lesser extent, scrap metal can be repeatedly remelted without the addition of fresh pig iron, since in the electric furnace there is no increase in sulphur as is always the case with the cupola.

The advantages to be gained by furnaces of this character are so apparent that they are bound to come rapidly into general use. The data taken in the test mentioned are shown in the accompanying table.

The Veness Lumber Co., at Winlock, Wash., is installing an Allis-Chalmers 500-kw. turbogenerator at its lumber mill, replacing an old unit of like capacity.

TAELE SHOWING ANALYSIS OF METAL BEING HELD IN MOLTEN CONDITION FOR 24 HRS. IN AN ELECTRIC FURNACE.

				Chemical Analysis					
Material charged.	Time.	Sample.	Condition.	Silicon.	Sulphur.	Comb. carbon.	Graphite.	Phos.	Mang.
1,500 lbs. pig iron....	1:20 p. m.	1	Before melting	2.21	0.021	0.76	3.21	0.604	0.59
	1:20 p. m.	2	Before melting	2.19	0.021	0.76	3.18	0.607	0.65
	1:20 p. m.	3	Before melting	2:21	0.021	0.76	....	.....	....
	4:20 p. m.	4	.....	2.20	0.026	0.55	3.03	0.590	0.65
	4:45 p. m.	5	.....	2.23	0.026	0.55	3.01	0.600	0.65
	5:18 p. m.	6	.....	2.22	0.025	0.55	3.03	0.600	0.65
	7:30 p. m.	7	Pouring temp..	2:18	0.026	0.55	3.07	0.600	0.65
	11:30 p. m.	8	.....	2.25	0.032	0.55	3.13	0.600	0.65
	9:30 a. m.	9	.....	2.23	0.032	0.55	2.98	0.610	0.63
317 lbs. borings	9:45 a. m.								
	10:35 a. m.	10	Borings melted	2.15	0.041	0.55	2.74	0.580	0.60
325 lbs. borings	10:45 a. m.								
	11:15 a. m.	11	.....	2.11	0.047	0.55	2.60	0.590	0.60

EDITORIAL COMMENT

Electricity in the Pageant of Progress

Comparatively few people have watched the almost miraculous development of preparations for the Pageant of Progress in Chicago, and some have expressed wonder at the smoothness with which the work has advanced. There was a marked lack of confusion and congestion, and materials, supplies and equipment moved to their destination with almost machinelike precision. It should be a matter of considerable pride to the electrical industry to realize that much of the success of this great task of preparation was due to the efforts of electrical men and the adaptability of electric service.

Visitors will see the displays, will watch the machinery in motion, and will use and enjoy the illumination, but few will understand the vital part in the entire exposition played by electricity. In the first place it would have been impossible to plan and arrange for the event without the telephone and other means of electrical communication. It would have been almost impossible to control and direct the army of men required to prepare the immense Municipal Pier for the exhibitors without these same communication devices. Illumination by other than electrical means would have been difficult and dangerous, and there is no other illuminant capable of producing comparable results with anything like equal costs.

It is questionable whether or not any scheme of transportation aside from electrically operated cars would be able to carry the visitors onto and away from the pier. Certainly automobiles could not perform this task, and if steam locomotives were used to haul standard railroad equipment there would be a great amount of noise and dirt to detract from the beauty of the show. It is also questionable whether or not any type of trucking equipment much different from the little trackless battery-operated electric trains could have handled the great bulk of material and equipment used in preparing the exhibitions. These trains moved about without confusion and carried loads of all sizes and shapes to every part of the great pier. They served almost like the "medium" of the fairy tale responding to the wish of the good fairy—it was only necessary to issue an order to have the little trucks deliver whatever was needed wherever it was wanted.

The moving machinery and displays are all motor operated, the entire show is electrically lighted, and everything is regulated and governed by speech and signals carried by electricity. In addition to all this there is still another thing to consider. The Commonwealth Edison Co. without any effort, and with scarcely a ripple of comment, has run the required lines and assumed the load of 2000 kv-a. as a matter of regular routine. Could a greater tribute be paid to the electrical industry? Without going into greater detail we may conclude that without electricity we would be without the Pageant of Progress or any other similar exposition. In fact, if we did not have electricity we probably would have but little progress to record, and would have but little need for such a demonstration.

Without doubt this Chicago event, staged at a most opportune time in our efforts toward business reconstruction, will do a great deal to stimulate the electrical industry even though this industry requires less mental lubrication to make its wheels go round than is needed in other industries. Yet it would seem that electrical interests must expend some of their latent forces of progressiveness in stimulating other industries to renewed activity in order to advance the cause of electricity.

For that reason it will behoove every person connected with the electrical industry who attends the big exposition to lose no opportunity of pointing out to visitors the many features of the show and of the individual exhibits that are dependent in any manner upon electricity. This sort of propaganda is becoming necessary because electricity is being so commonly employed to produce effects and results without itself being heard or seen that people take it as a matter of course—as they take the currents of air and water—and do not stop to consider the many ways in which they may utilize some of it to their personal advantage. Thus will the Pageant of Progress benefit the electrical industry.

The Coal Supply

It appears that a great many central station companies have not as yet made arrangements for their coal for the coming year. Comments and figures in the June 18 issue of ELECTRICAL REVIEW called attention to the fact that there would be an ample supply of coal for the coming winter, provided steps were taken to provide a sufficient reserve at points of use prior to the winter season. In a recent letter to J. W. Lieb this point is again brought up by Herbert Hoover,

secretary of commerce. The following extract from this letter indicates the attitude taken by Mr. Hoover:

"I would like to call the attention of your association to the bituminous coal outlook. There is every indication that there has been an undue slackness in the purchase of coal, which may accumulate to large demands in the autumn. I am convinced that due to the general depression the prices of bituminous coal at the mines is not too high at the present time. This is, I think, proved by the fact that numbers of operating coal companies are making no profit whatever. If there should be a recovery of business activities in the autumn, taken in conjunction with the large increase in percentage of disabled cars (from 5% to 16% during the past 6 mo.) and the inability of the railroads to finance their maintenance there are possibilities of development of a most serious situation as regards coal movement.

"I cannot but feel that the Interstate Commerce Commission in the face of warnings they have sent out in this connection would not be disposed to give any priority in such an event. It seems to me, therefore, to be obvious that the public utilities companies, both in their own interests and for the protection of the public, should make early provision for stocks of coal sufficient to carry them over a critical period."

Consider the Reader

The tendency on the part of many writers is to publish all they know on a particular subject without regard to the requirements of the average reader. It is always possible to follow up a particular line of study by referring to the published proceedings of the scientific societies, or to the technical journals; and the value of a textbook depends less on the mass of information contained therein than upon the soundness of the views it expresses, its clearness and its suggestiveness. An article or book that is not to some extent stimulating—that is not more than a mere compilation of previously known facts or principles uninfluenced by the personality of the writer—is of little value, whether it be an engineering treatise or a narrative of a less restricted kind.

The Mercury Arc Rectifier of Large Capacity

Considerable progress has lately been made in Europe in the matter of replacing running machinery in substations by mercury arc-rectifiers on account of the work done by Brown-Boveri & Co., who have succeeded in producing a commercial rectifier capable of operating satisfactorily on outputs up to 1500 kw. per unit. Any number of units may be operated in parallel, and an account of the high efficiency of this form of converter and the fact that it does not require the attendance necessary with running machinery it is rapidly gaining favor abroad as a substitute for motor generators or rotary converters when it is desired to rectify an alternating current.

The advantages of having a stationary d-c. substation plant are obvious, and it looks as if the large mercury-arc rectifier had come to stay since even in its present form it is giving satisfaction in a number of places on the continent of Europe—the aggregate output of these rectifiers in operation at the end of 1920 totaled 53,000 kw.

It is well known that the mercury arc, when operating in a vacuum, has the peculiar property of permitting the passage of current in one direction only; in other words, it acts as an electric valve which opens only to permit currents to pass in one direction. Actually very minute currents amounting to a few milliamperes are found to pass in the opposite direction, but this does not effect the practical operation of the rectifier.

The voltage drop in the arc is the sum of three separate drops due respectively to the anode, the cathode, and the arc itself. The drop at the electrodes is practically constant and does not depend upon their composition, on the current density, or on the vacuum. With iron anodes the drop is 6.5 volts, and for the mercury cathode 5.5 volts, making a total of 12 volts. The arc itself has a variable drop which depends upon the vacuum, the current density and the section of the arc. It is directly proportional to the vacuum and inversely proportional to the current density and arc section. In the large rectifiers with an arc 80 cm. long the drop in the arc would be about 8 volts, or 0.1 volt per cm. This, together with the 12 volts drop at the electrodes, makes a total drop of 20 volts which is the pressure necessary to maintain the arc. This drop is found to be approximately constant at all loads so that the efficiency of the mercury-arc rectifier is also constant at all loads. Obviously, the higher the pressure the higher will be the efficiency. The efficiency will be about 91.6% at 220 volts, 96.5% at 550 volts, and 98.5% at 1500 volts. The above figures are taken from an interesting article by R. L. Morrison in a recent issue of the *Electrical Review* (London) in which the author describes in detail the latest construction of the Brown-Boveri mercury-arc rectifier.

The single-phase rectifier is necessarily somewhat limited in its applications because of the pulsating nature of the direct current which it produces. It is true that both halves of the alternating wave are rectified, because the transformer secondaries are so connected as to utilize both positive and negative half-waves. However, a pulsating direct current is produced with variations ranging from about 60% to maximum value, even when reactance coils are purposely connected in the circuit with a view to smoothing out the irregularities.

The 6-phase rectifier, which has six anodes and one cathode, very materially reduces the current variations on the d-c. side and gives very good service. The individual anodes carry current only so long as the momentary value of the

corresponding phase pressure exceeds that of the adjacent phases—that is, during one-sixth of a cycle. But by the use of suitably designed choke coils two or three anodes can be made to carry current at the same time, and this results in a reduction of the peak currents and the prolongation of the half-waves so that the amplitude of the undulations in a 6-phase rectifier need not exceed about 8% of the maximum amplitude of the a-c. wave.

It is interesting to note that for a polyphase rectifier the theoretical root-mean-square value of the phase current is equivalent to the total direct current divided by the square root of the number of phases. Thus, since 2.45 is the square root of 6 we have for a 1000-ampere 6-phase rectifier a theoretical phase current of 408 amperes, but in practice the divisor usually lies between 2.8 and 3.5.

Many serious difficulties were encountered in the early development of large steel rectifiers. These included difficulties in making large steel cylinders absolutely gas tight, the provision and design of insulation capable of withstanding the high temperatures at which it is necessary to operate the electrodes, and the frequent occurrence of internal short-circuits.

The form of seal now used by Brown-Boveri & Co. consists of an arrangement of asbestos washers clamped between steel bolts, with mercury poured into spaces provided around the bolt and anode insulator and filling up any irregularities in the surface of the materials with which it comes in contact. It is found that air will not percolate through these joints, and it is quite possible to maintain a vacuum of 0.01 mm. of mercury.

Short-circuits were very frequent in the earlier designs when the pressure was raised above 220 volts, but gradually the causes of this trouble were removed and at present the chance of an internal short-circuit is almost negligible. One of the causes of these short-circuits was insufficient vacuum, but with the very satisfactory form of vacuum pump now used with this apparatus this trouble no longer occurs. Continuous abnormal loading is objectionable and dangerous just as in the case of running machinery—the temperature of the anodes must not be permitted to exceed the safe working limit, because the valve action would then cease and the current would flow in both directions producing a short-circuit. Protective gear is provided to guard against such an accident.

The rating of large rectifiers is governed by the current-carrying capacity of the anodes. Three sizes have been standardized by Brown-Boveri & Co., the continuous rating being respectively 300, 600 and 1000 amperes. Any one of these designs may be used for pressures up to 750 volts, and with slight modifications up to 1500 volts. It is probable that this type of apparatus will be used in the near future for pressures up to 3000 and even 5000 volts, which gives the mercury-arc rectifier an advantage over the rotary converter which is not easily designed for high pressures.

Present design of this apparatus provides a large lower chamber in which the arc operates between the six main anodes and the single mercury cathode, the ascending vapor being condensed in a narrow upper chamber which is cooled by circulating water. The cathode base and the anode plate (the hottest part of the apparatus) are also jacketed and cooled by circulating water.

The arc is started by an ignition anode which is operated by the iron core of a solenoid, the ignition current being provided by a small 110-volt converter. This current is interrupted by the automatic action of the solenoid and a spring as soon as enough vapor is generated to start the main arc, the time required being about 2 sec.

These rectifier units are easily operated in parallel, the d-c. voltage being controlled either by step-by-step regulation from the primary side of the transformer, or by an induction regulator operated by hand or automatically, the induction regulator being generally preferred because the voltage can be varied smoothly to any desired extent. When the control is automatic the substation may be left for considerable periods of time without any attendant.

The efficiency of the rectifier proper is constant at all loads, but the overall efficiency of the complete equipment must take account of the losses in the main transformer and auxiliary gear.

Units of 1500-kw. capacity operating on 25-cycle circuits of 550 volts have an efficiency of 93.5% at full load and 92.3% at 25% load. A 1000-kw. unit on a 50-cycle circuit would have efficiencies of 94% and 93%, and a 500-kw. unit would have efficiencies of 93.8% and 92.3%. At full load these efficiencies are only slightly higher than those obtainable with modern rotary converters, but at low loads they are much better. The corresponding quarter-load efficiencies of rotary converters would probably be about 87% for the two larger units and 85% for the 500-kw. unit, thus showing the advantage of the mercury-arc rectifier over running machinery at light loads. This form of converter is especially well adapted for handling fluctuating loads. Frequency has no bearing on its output or operation except so far as it affects the design of the transformer and auxiliary gear. Rectifiers of this type can readily be coupled in parallel even when supplied with energy at different frequencies.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

REVIEW HISTORY OF ASSOCIATION AT BUFFALO CONVENTION.

General Sessions of N. A. E. C. D. Featured by Addresses on Contractor-Dealers' Problems and How Best to Meet Them.

The anniversary convention and the 21st annual gathering of the National Association of Electrical Contractors and Dealers, held in Buffalo last week, proved to be one of the most enthusiastic conventions in the history of the Association. While not officially announced, it is understood that the annual convention for 1922 would be held in Cincinnati, beginning Oct. 11. The first two days—July 18-19—were given over to meetings of the Executive Committee, summary of which appeared on pages 131 and 132 of the July 23 issue of ELECTRICAL REVIEW. A report of the general sessions follows.

Wednesday morning's session was opened by E. D. McCarthy, local chairman, who introduced the Hon. George S. Buck, mayor of Buffalo. The earnest and hearty welcome of the Association to Buffalo, its birthplace 20 yrs. ago, extended by the mayor, was responded to by James R. Strong, national chairman.

Charles L. Eidlitz, first president of the Association, was introduced and humorously and entertainingly recalled incidents of 20 yrs. ago and briefly recounted the history of the Association, summarizing its big accomplishments as obtaining representation on the Electrical Committee in charge of the National Electrical Code; establishing the Standard Symbols for wiring plans; originating and printing the universal data and sales book; establishing a standard cost accounting system for large contractor-dealers; developing a business record system for small contractor-dealers and arranging for an employers liability insurance for members of the Association.

Before concluding Mr. Eidlitz called the roll of the charter members of the Association 20 yrs. ago. The following were present and received a badge of originality: H. Alexander, J. F. Burns, S. Davis, C. L. Eidlitz, J. P. Hall, J. C. Hatzel, A. J. Martin and J. R. Strong, of New York City; M. J. Almstead, Chicago; Frank L. Barnes and Albert Mann, Boston; H. G. Hatfield and M. H. Johnson, Utica, N. Y.; M. S. Horton and B. A. Vandy, Rochester, N. Y.; C. M. Jones, Minneapolis; E. S. Keefer, Brooklyn, N. Y.; W. H. Morton, East Orange, N. J.; E. McCleary, Detroit; E. D. McCarthy and H. I. Sackett, Buffalo, N. Y., and E. W. Newman, Albany, N. Y. Other founders present were W. C. Ballada and B. V. Butts, Utica, N. Y.; E. Bochesenstein, Emil Haas, F. E. Newberry, C. J. Sutter and S. A. Van Nort, St. Louis; W. A. Carrao, Long Beach, Cal.; Thomas E. Clark, Detroit; Frank L. Frost, Albany, N. Y.; J. S. Hilton, Syracuse, N. Y., and E. B. Keller and H. A. Loeb, Philadelphia.

The final speaker of the morning session was Samuel B. Botsford, a Buffalo attorney and ex-president of the Buffalo Chamber of Commerce. He treated his subject of "The Business Outlook" in a comprehensive, constructive manner and stated the American people must learn to save and invest wisely if this country is to build up an export trade that alone will insure prosperity. He forecasted that a period of changes was imminent and the man who could participate the most in these changes, would profit the most.

At the opening of the afternoon session a resolution was passed conferring honorary membership upon John R. Galloway, Washington, D. C., and Ft. Myers, Fla., past-president of the Association and since retired from the electrical contracting business.

Then Col. Robley S. Stearnes, past-president of the Association, after an appropriate address, presented to W. Creighton Peet the emblem of the Order of Past-Presidents of the Association. In accepting Mr. Peet expressed his appreciation of and gratitude for the honor bestowed upon him by the officers and members.

"Installation Costs" was the subject of an interesting paper presented by Kenneth A. McIntyre, Toronto, Can., which was followed by an instructive paper by Alfred E. Martin, South Bend, Ind., on "Financing the Contractor-Dealer." Mr. Martin's paper appeared on pages 119-124 of the July 23 issue of ELECTRICAL REVIEW.

GOODWIN TALKS ON "CAPITALIZING YOUR OPPORTUNITIES."

W. L. Goodwin was the next speaker, but before beginning his address on "Capitalizing Your Opportunities," Chairman Strong presented him as a token of appreciation, with a handsome leather bound inscribed illuminated book, containing the original signatures of the 2200 odd members of the Association and an engrossed copy of the following resolutions: "The National Association of Electrical Contractors and Dealers in convention assembled at Buffalo, N. Y., on the 20th day of July in the year 1921, being the 20th anniversary of the Association, hereby makes record of its profound appreciation of William Lincoln Goodwin as a man and leader of men; a man of courage and conviction; a man of vision and sincerity; a man lovable and just; a leader fearless and persevering; a leader aggressive and determined; a leader wise and resourceful. He has done more than any other man to put electrical retailing on a proper business basis and to promote harmony and co-operation throughout the entire industry. It is a privilege to have known him and we wish him Godspeed in his work."

Mr. Goodwin said in part: "The essentials

for capitalizing our opportunities are observation, analysis, thought and work, and in the electrical business each individual must decide for himself whether he shall become a contractor, merchandiser or combination of the two. The merchandiser is undoubtedly needed in small communities while a strictly contracting business could survive in large cities. This is a time for optimism. The public is not on a buying strike but ready to buy carefully and conservatively, if properly sold. The electrical industry is capable of doing more for the housing problem of the American people than any other and competitors in each community should be gathered together and a mass action concerted retail sales campaign started. Then the small business at hand would be uncovered and not be passed by as at present.

"The electrical merchant must realize that he is not dealing in necessities but that only through intelligent salesmanship can selling in volume be attained. One of the serious faults of this branch of the industry is that the contractor does not get paid for the knowledge of knowing how. This is the time to use wise discretion and intelligent management in business and to protect yourself from those who are trying to destroy the constructive work of the Association, be honest with yourself, your customer, your supplier and your competitor."

In conclusion Mr. Goodwin briefly described the activities and future plans of the Society for Electrical Development.

Co-operation Between Electrical Manufacturer and Contractor-Dealer.

The report of Special Representative Laurence W. Davis opened the Thursday morning session. Mr. Davis gave his observations during his travels of the past year and described the results obtained through association work in various localities in the country. In conclusion he made specific recommendations on how members could derive the most benefit from the Association and requested their full co-operation when he was in their individual territory.

John J. Gibson, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., gave facts on the subject question "Are the Manufacturers' Efforts Appreciated?" He said that manufactured electrical products are looked upon by merchants in the same light as other commodities, such as groceries, and few realize the essential factors and equipment that must be maintained for their production and the expense and effort to which manufacturers must go to create the demand. About $750,000,000 worth of electrical merchandise is yearly handled by contractors and dealers and of this sum a low estimate would allow at least 1% for manufacture, 1% for advertising, 8% for distribution, 50% invested in plant and 6% allowed earnings.

Manufacturers thus spend over $100,000,000 annually for these benefits of the industry and a similar amount to keep the industry employed. In concluding Mr. Gibson stated the manufacturers realized that the contractor and dealer was essential to them, but did they appreciate just what the manufacturer was doing?

"Electrical Contractor-Dealer versus Non-electrical Dealer" was the subject of the address made by William E. Robertson, Buffalo, N. Y. It was Mr. Robertson's opinion that ultimately the distribution of electrical merchandise would be entirely through electrical channels and not handled at all as now by hardware, drug and department stores, and in time department stores would give up selling motor-driven appliances. While originally the contractor confined his business to wiring, the output of manufactured electrical merchandise increased so rapidly that the ordinary channels of distribution were inadequate and therefore the contractor undertook merchandising. For the first few months to a year every electrical appliance requires service, but a repair department in connection with a retail sales store is a source of much irritation and dissatisfaction, and therefore it is better to keep the contracting department in the rear of the store and the merchandising in the front, but not to carry a big stock, simply buy from the supplier as needed.

The paper on "The Conduct of Electrical Contractor-Dealer Business," by M. H. Johnson, Utica, N. Y., opened the afternoon meeting.

A motion was passed recommending that the Association copyright, legally protect and adopt for use the following words: *Elec*trâgy—Name of the trade or business of electrical contractor-dealer; *elec*trâgist—a person conducting such a

Gathering of the Contractor-Dealers at Their 21st Annual Convention of the National

business; electrâgician—a person working at the business; electrâgize—a verb—to work at the business—or to provide electrical equipment; electragic—an adjective—relating to the business; electragian; electragial.

Chas. L. Estey, Chicago, gave a constructive and forceful address on "What a Trade Organization Can Do and What Some Are Doing." After pointing out in detail the mutual value of associations to members and members to associations, he declared that the one great difficulty was getting the big men to work shoulder to shoulder, co-operate and accomplish things.

In his paper on "Economics of Retail Distribution," C. H. Rohrbach, New York City, secretary of the American Society of State Executives, defined economics as the things you do or ought to do to make money, and all successful business men have an accounting system and are taking into consideration turnover, right buying, pricing the merchandise, display or store arrangement, specialization, or special rates, store location and service. A successful accounting system must make proper record of jobs, time and material, money, in or out; bills, owed or owing; goods coming, going or on hand and produce a balance sheet. Right buying means right merchandise, right price and in right quantities. Mr. Rohrbach then proceeded to point out the right and wrong methods to follow in conducting a retail store.

Hugh A. Calderwood, Carnegie University of Technology, briefly explained and described the course in electrical contracting and merchandising this institution was now offering.

Wit and humor interspersed with serious thoughts predominated at the annual banquet held on Thursday evening (presided over by William H. Kenney) when Harry Collins Spillman, sales manager of the Remington Typewriter Co., New York City, as speaker of the occasion made an interesting address on "Adjusting Ourselves to a New Business Era."

Adequate Wiring for Proper Residence Lighting.

The closing session of the convention on Friday was opened by M. Luckiesh, Nela Research Bureau, Cleveland, speaking on "Adequate Wiring for Proper Residence Lighting." He advocated separate circuits for both the strictly lighting outlets and convenience outlets which could be used for portable lamps or appliances, and recommended that contractors multiply by five the number of outlets commonly specified, to insure adequate equipping of the residence. In conclusion Mr. Luckiesh stated that with portable lamps and adequate outlet facilities it is possible to get mobility of light and do away with ceiling fixtures.

O. H. Caldwell in talking on "The Home Electric Idea" described the success of the plan in California, Cleveland and elsewhere, and showed how by co-operating with the local real estate man or realtor, those engaged in the electrical industry could bring to the attention of the public the advantages of electricity and create such an interest that much profit would result.

For the first time in the history of the Association a convention was addressed by a woman when Miss Beatrice Irwin, an Associate in Arts of Oxford University in England, a member of the Illuminating Engineering Society and the author of several books, one of which is entitled "The New Science of Color," spoke on "Color Effects in Lighting." Miss Irwin has made a scientific study of all forms of color and is now applying the results of her knowledge to electric lighting. The main features of her talk appear elsewhere in this issue.

Chairman Strong pronounced as the keynote and slogan of the convention, "Sell Yourselves First," meaning that with present business conditions it is necessary to be sold yourself on the goods you are handling before you can expect to sell anybody else.

SECTIONS OF A. M. E. S. APPOINT OFFICERS.

The following sections of the Associated Manufacturers of Electrical Supplies have announced through the office of the general secretary, Charles E. Dustin, 30 East 42d street, New York City, their officers for the ensuing year.

Fuse Section: Chairman, C. A. Bates, McBride Electric Co.; secretary, F. N. Conant, Chase Shawmut Co., and treasurer, N. E. Tre-

National Association of Electrical Contractors and Dealers in Buffalo, July 18-23.

ganza, Economy Fuse & Manufacturing Co. Snap Switch Section: Chairman, J. P. Williams, Hart & Hegeman Manufacturing Co.; secretary, H. C. Pond, Arrow Electric Co., and treasurer, Clarence Renshaw, National Metal Molding Co. Line Material Section: Chairman, Louis MacCarthy, Macallen Co.; secretary, J. R. Palmer, Ohio Brass Co., and treasurer, H. G. Lewis, Electric Service Supplies Co.

Also the following members were appointed to constitute a committee to work with the Power Transmission Committee of the American Electric Railway Association in preparation of standards covering railway line materials: J. R. Palmer, Ohio Brass Co.; W. G. Carey, General Electric Co.; L. F. Brahmer, Westinghouse Electric & Manufacturing Co. and Jas. H. Drew, Drew Electric & Manufacturing Co.

A WOMAN ILLUMINATING ENGINEER DISCUSSES LIGHTING.

Advantages of Various Light Intensities in Combination With Color Demonstrated Before Contractor-Dealers at Buffalo.

At the 21st annual convention of the National Association of Electrical Contractors and Dealers held in Buffalo, July 18-23, Miss Beatrice Irwin, New York City, addressed the delegates on the subject of "Color Effects in Lighting." Some of the principal points brought out in Miss Irwin's talk are presented herewith:

"If you will lend me your most critical eyes combined with unprejudiced ears we shall come to an understanding that should not only tend to advance our mutual interest, but more important still, should contribute a new aim and essential to the science of art and business of illumination. That aim is detailed discriminating and scientific application of color to illumination. There are several reasons why this new essential in illumination is being increasingly craved by the public and the chief reason is a self-protecting reaction against glare and direct lighting. Color provides an antidote to this condition, but evil application often creates an evil worse than that it seeks to remedy.

"Hitherto efficiency and fixture have been the two main issues of development in illumination, but if color increases efficiency and inspires new and better fixtures, why should we not add a scientific application of color as a third and profitable essential to the science of art and business of illumination.

"Filter illumination which was presented at the Buffalo Market in February now returns under the name of 'Nuralite,' derived from a Persian word which means light. The first aim of 'Nuralite' is to present such balanced strength of radiant color as will prove, through a series of simple and efficient lighting devices, the hitherto unsuspected benefits to be derived from a psychophysiological use of the entire solar spectrum. It presents color of determined values in prescribed proportions designed to achieve results, either in general or special illumination problems.

"If a fixture is to achieve a real unity with radiant color, which is in itself so full of vibration, it should be as simple and plain in line as possible. According to the total vibratory value of the color and its effect as contained in the filter, which is properly keyed to the needs of both room and individual, the principles are classified as sedative, recuperative and stimulant.

"Overhead filters are designed to create diffusion of light with delicate color values in blues, golds, oranges and rose. Portable filters are a concentration of lighting with stronger color values in rose, orange, greens, golds and violet.

"Doubtless much that is available in fixtures could be utilized, and better still, 'Nuralite' should stimulate new designs in fixtures, more delicate perhaps in treatment and more in keeping with the slender elegance that characterizes modern decoration and is a characteristic reflex of our splendid use of elimination, speed and nervous energy.

"So I am relying on the fixture designers to advise and to co-operate further on this point. Halls and entrances instead of being sombre should radiate recuperative and stimulant colors. Sedative and recuperative tints are most suitable for diningrooms, stimulant colors for reception rooms and recuperative and sedative schemes for bedrooms. The most important point to observe, however, is that every surrounding should meet the individual requirements of the person who lives there.

"If we come to think of it, color is the ultimate signature of vibration, the initial impetus of all energy. Take one example, metal which in its final fusion is known by the color of its flame. Why, therefore, should we not consider color dynamically as a creative force instead of a mere decorative detail, as an essential rather than as an adjunct of illumination.

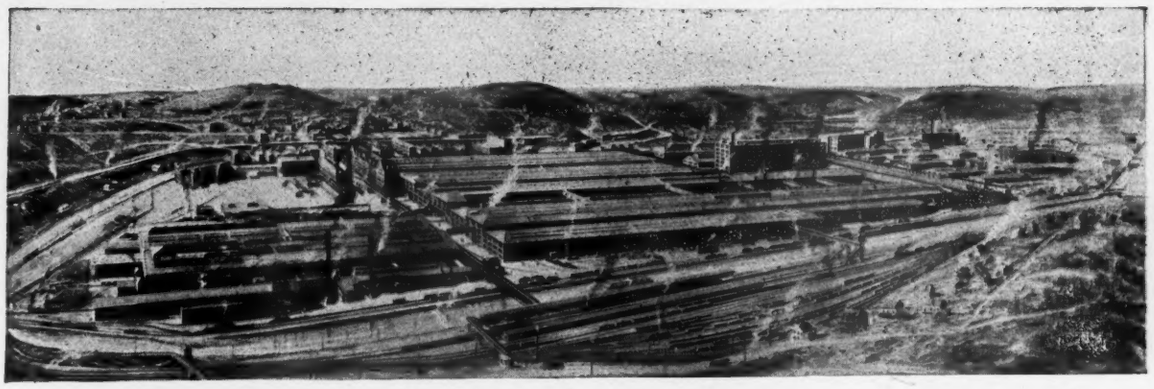
"The flame of color science is a diamond flame, uniting all the rays of the spectrum in its service, eager for the union which animates progress and a flame which hopes to merge color, efficiency and fixture in the art, the science and the business of illumination into one kindred and co-operative whole."

At the conclusion of this paper Miss Irwin proceeded to give a demonstration of the effects of color in lighting and showed the advantages of various light intensities in combination with color as obtained with a fixture equipped with a dimming socket.

ACTIVITIES OF WESTINGHOUSE ON PACIFIC COAST.

Company Plans to Erect Factory at Emeryville, Cal., to Provide Increased Facilities for San Francisco Service Shop and Warehouse.

The Westinghouse Electric & Manufacturing Co., one of the largest manufacturers of electrical machinery in the world, has recently purchased at Emeryville, Cal., a 12-acre tract of ground adjoining the Southern Pacific railway, upon which it will shortly erect a factory, which will give increased facility and space to its San Francisco service shop and warehouse. This probably will be followed by the erection of additional buildings that will provide facilities for assembling electrical machinery for use on the Pacific Coast. Parts of electrical machines will be shipped in quantity and assembled and tested in this coast plant. This practice will pre-



Panoramic View of East Pittsburgh (Pa.) Works of Westinghouse Electric & Manufacturing Co.

vent delays in shipments and in every way contribute to better service for coast cities.

This important move on the part of the Westinghouse Electric & Manufacturing Co. is the outcome of a visit the latter part of 1920 to the Pacific Coast by two of its officials, H. P. Davis, vice-president, in charge of operations, and W. K. Dunlap, acting vice-president. This visit comprised a trip up and down the coast for the purpose of considering conditions with the different local representatives, including W. H. Whiteside, general representative; K. E. Van Kuran, manager of the Los Angeles district; C. E. Heise, manager of the San Francisco district, and W. D. McDonald, manager of the Seattle district.

These Westinghouse officials were greatly impressed with the activities of the Pacific Coast, and the wonderful promise for electrical and industrial development in the future. They expressed themselves as being convinced of the necessity of broadening and improving the company's activities in Los Angeles, San Francisco and Seattle.

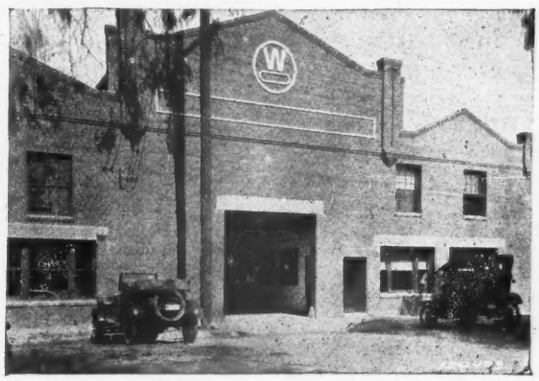
The Westinghouse Electric & Manufacturing Co. maintains in each of these cities sales offices, warehouses and thoroughly up-to-date service and repair shops. Through the service shops it has been able to serve its customers in making repairs and furnishing quick service in cases of breakdowns. The superintendents of these shops are men of long experience in such activities with the Westinghouse company, and are thoroughly acquainted with its apparatus and policies.

The service has been so much appreciated by the Westinghouse customers that it is the company's desire to improve it, and feeling that the future demands will be largely increased because of the splendid growth of the electrical business on the Pacific Coast, it has planned to provide permanent locations so that this growth may be properly prepared for.

It was the opinion of Messrs. Davis and Dunlap that the time is not far distant when it will be desirable and necessary for the Westinghouse Electric & Manufacturing Co. to assemble and manufacture apparatus on the Pacific Coast, and with this in mind negotiations were undertaken in the coast cities with the view of consolidation of the company's interests so as to prepare for better service in all branches with provisions for extensive additions to existing facilities in the future, as demanded.

The Westinghouse Electric & Manufacturing Co. has its main plant at East Pittsburgh, Pa., and has plants in many other cities. Among these are South Philadelphia, Pa.; Newark, N. J.; East Springfield, Mass.; Cleveland and Mansfield, O. The company states that if the venture at Emeryville is successful it will soon be followed by similar undertakings in Seattle and Los Angeles.

It has been the policy of the Westinghouse company from the start respecting its Western representatives to employ men who are natives of the Pacific Coast. C. E. Heise, manager of the San Francisco district, was graduated from the University of California in 1898 and entered the



Westinghouse Service Station at Los Angeles.

employ of the Westinghouse Electric & Manufacturing Co. the same year as construction engineer. From this position he has advanced from time to time until in 1912 he received the appointment of manager of the San Francisco district.

THE LAKE ROUTE FOR A PLEASANT VACATION TRIP.

Lake Erie has long been noted for its fleet of magnificent passenger steamers. The most recent addition to this fleet is the S. S. *Seeandbee,* one of the largest and most costly passenger steamers on inland waters of the world. This ship, with her sister ship, S. S. *City of Buffalo,* plys daily between Cleveland and Buffalo, so that one may board the steamer at either city any evening at 9 p. m., enjoy a night of refreshing sleep and arrive at destination the following morning at 7:30. In addition to the night trips, the Saturday daylight trips are proving very attractive to many travelers.

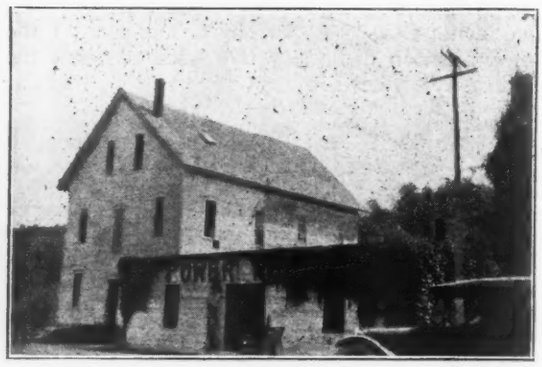
From Cleveland the C. & B. line steamer *City*

of Buffalo leaves the new pier at the foot of East Ninth street every Saturday during the summer season at 9 a. m., arriving at Buffalo at 7 o'clock in the evening of the same day. From Buffalo the *Seeandbee* leaves the wharves at the South Michigan avenue bridge every Saturday during the summer season at 9 a. m., arriving at Cleveland at 7 o'clock in the evening of the same day; all Eastern standard time.

UTILIZING THE OLD MILL SITES FOR POWER GENERATION.

The accompanying illustration shows a phase of electrical development which is becoming more and more common in the Middle West. Some 60 years ago there were thousands of small grist and flour mills running in Wisconsin, Iowa, Minnesota and other northern states which were in those days just being settled, and wheat was the one crop grown on the new land. With no railroads to bring flour to the frontier it was absolutely necessary in order that the pioneers might have bread to eat to open up small mills where they could take their grain and have it ground.

So it happened with every advance of the



Power Development at Site of Old Mill on Kickapoo River.

frontier westward and northward that there was a search for a mill site along rivers and streams. Sometimes even small creeks were harnessed and made to give enough power to turn a millstone. With the advent of railroads the concentration of flour milling in cities, and particularly with the change from wheat to corn, great numbers of these mills were forced to close down. Some were wrecked while many were just abandoned and for years have been standing idle.

Within the last decade as electric development has been carried to villages and farms it has been found that many of the old sites of these abandoned mills are excellent power sites. In many places concrete dams have been placed in the streams where the old rock and log structures used to be and a modern power house has been built alongside the old abandoned pioneer mill. From these plants energy for electric light and power is being transmitted over the surrounding country to the farm farms and villages which used to depend upon the mill for flour. The picture, taken at Viola, Wis., shows such an abandoned mill and an adjoining power plant. Water is impounded by a dam in the Kickapoo river which flows just on the other side of the mill. The Kickapoo river was a great milling stream in early days. Now in nearly every town along the river a power site which used to operate a mill is used for generating electric light and power.

COAL CONSUMED BY POWER PLANTS.

During the first 4 mo. of the present year the public utility power plants in the United States consumed a total of 7,732,594 tons of coal, according to figures just compiled by the U. S. Geological Survey. The consumption shows a decline dating from January, being 2,984,154 tons in that month, and 2,429,171 in April. The mean daily output in kilowatt-hours for the different months was: January, 114,200,000; February, 113,500,000; March, 109,800,000; and April, 108,000,000.

U. S. COURT DISMISSES SUIT.

Word was received from Pine Bluff, Ark., to the effect that the United States Court for the Eastern District of Arkansas on July 14 dismissed a suit filed the evening before by the Morgan Co. *et al* against the Citizens Ice & Public Utilities Co., of Junction City, and the Arkansas Light & Power Co.

America used about 13% more electricity in 1920 than in the previous year.

COMING CONVENTIONS.

Pageant of Progress Exposition, Municipal Pier, Chicago, July 30-Aug. 14.

Michigan Electric Light Association. Annual convention, Ottawa Beach, Mich., Aug. 24-25. Headquarters, Hotel Ottawa. Secretary, Herbert Silvester, Ann Arbor, Mich.

New England Geographic Division of the National Electric Light Association. Annual convention, New London, Conn., Sept. 6-9. Headquarters, Hotel Griswold. Secretary, Miss O. A. Bursiel, 149 Tremont street, Boston.

International Association of Municipal Electricians. Annual convention, Colorado Springs, Colo., Sept. 6-10. Secretary, Clarence R. George, Houston, Tex.

Great Lakes Geographic Division of the National Electric Light Association. Annual convention, French Lick Springs, Ind., Sept. 14-16. Secretary, R. V. Prather, 305 De Witt Smith building, Springfield, Ill.

Indiana Electric Light Association. Annual convention, French Lick Springs, Ind., Sept. 14-16.

Association of Iron and Steel Electrical Engineers. Fifteenth annual convention, Chicago, Sept. 19-24. Headquarters, Hotel La Salle. Secretary, John F. Kelly, Empire building, Pittsburgh.

Illuminating Engineering Society. Annual convention, Rochester, N. Y., Sept. 26-30. General secretary, Clarence L. Law, 29 West 39th street, New York City.

American Electrochemical Society. Meeting at Lake Placid Club, N. Y., Sept. 29-Oct. 1.

New York Electrical Show, 71st Regiment Armory, Park avenue and 34th street, New York City, Sept. 28-Oct. 8. General manager, George F. Parker, 124 West 42d street, New York City.

Cleveland Section of the American Society of Mechanical Engineers. Great Lakes regional meeting, Cleveland, Oct. 3-4. James Guthrie, Fidelity building, Cleveland.

Southeastern Geographic Division of the National Electric Light Association. Annual convention, Chattanooga, Tenn., Oct. 18-20. Headquarters, Signal Mountain Inn. Secretary, Charles A. Collier, Electric and Gas building, Atlanta, Ga.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

Temperature Recorder With Resistance Detectors.

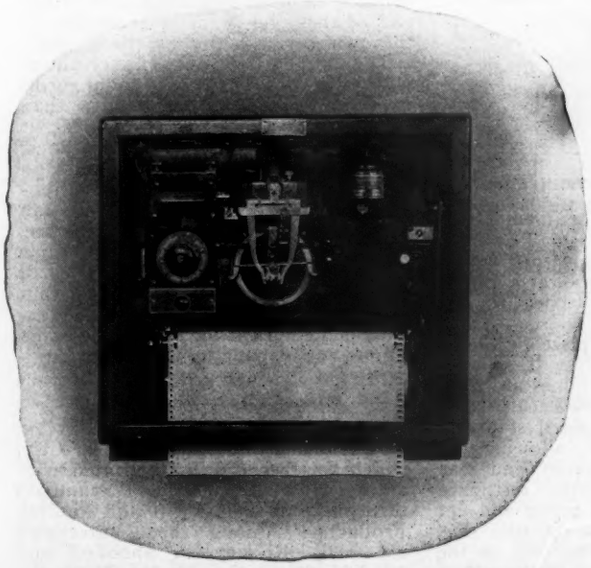
Since heating in electrical apparatus or cable causes deterioration in the dielectric, it limits the safe load and therefore it is most important to know by measurement the temperatures at vital points so that control of load may be regulated with accurate knowledge of the existing conditions.

Large manufacturers of electrical apparatus, realizing the importance of accurate temperature indications, are making provisions for such measurements by regularly embedding detectors in their generators while several large central station companies are placing detectors in their cable ducts.

Leeds & Northrup Co., 4901 Stenton avenue, Philadelphia, makes automatic temperature recorders for use with thermo-couples or resistance coil detectors which are suitable for measuring generator, cable and transformer temperatures. These instruments for thermo-couples are of the potentiometer type, give instant indications and continuous records and if desired will operate signals or alarms when the danger temperatures are approached. For use with resistance detectors, a Wheatstone Bridge circuit is provided in the recorder itself.

The recorder for thermo-couple detectors is calibrated for standard copper-constantan thermo-couples, range 0-200 deg. C., accuracy 1 deg. C., while that for resistance coil detectors has a range of 0-200 deg. C. for any type of detector having a fundamental resistance of 10 ohms or over; accuracy 1 deg. C. against standard temperature-resistance data of the coils to be used. In both instruments all terminals are back of the board and the driving motor may be furnished for use on 110 volts a-c., 110 volts d-c., or 220 volts d-c. The chart is 10 ins. wide, has rectilinear co-ordinates and a practically proportional scale and the paper speed is 1⅜ ins. per hr.

The temperatures of interest may be recorded on a chart at the switchboard and indicated at another point on a remote index, a round pattern meter with a scale of 50-150 deg. C., with the lamp signal board included. The meter indicates the temperature of the detector connected at that instant to the recorder and the lamp board designates which couple is connected.



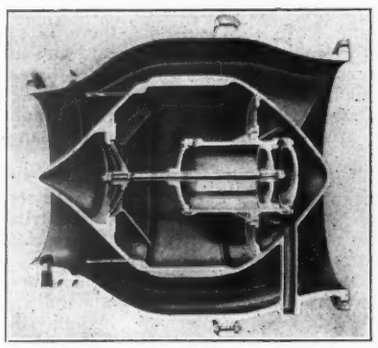
Leeds & Northrup Automatic Temperature Recorder.

Features of "W-S-M" Balanced Plunger Hydraulic Valve.

The new balanced plunger hydraulic valve recently placed on the market by the Wellman-Seaver-Morgan Co., Cleveland, consists essentially of a body of circular section. This contains an internal cylinder closed at one end forming a central chamber in which there is a sliding plunger connected to an operating cylinder on the conical head of the internal cylinder by means of a connecting rod. There is a pipe connection leading from the central chamber to the neck of the valve which maintains the plunger in a balanced condition at all times. On the mechanically operated type gearing supplants the operating cylinder as a means of moving the plunger. The forces operating the plunger of this valve are entirely independent of the variable forces acting on its nose. An external control valve is connected to the operating cylinder by means of suitable piping.

Some of the features of this type of valve are thus set forth by the manufacturer: The valve may be operated quickly, easily and safely in flowing water regardless of pressure due to the fact that the plunger is completely under control during its entire stroke because of the equalizing connection; the valve will not slam or creep shut; the control mechansm has been reduced to the simplest form consistent with reliable operation. There is a renewable seat ring on the plunger which engages with a renewable seat ring in the neck of the valve when the plunger is closed. These rings of dissimilar metal are carefully ground together to a perfect fit; also the plunger or sliding element is self-contained in the valve body, and when a perfect fit is once obtained in the shop it is impossible to throw it out of alignment when assembling in the field.

It is further stated that a standard valve is provided with hand control, but may be equipped for remote electrical control where this is a necessity or an actual convenience. Hand operation is also supplied when remote electrical control is furnished. All stop valves in the control piping are normally wide open, thus eliminating the wear or wire cutting of the seats which is liable to occur under high pressures when such valves are partly open. There is no possibility of sediment or sand collecting in the operating cylinders. The control valve connections are of ample size and the ports in the operating cylinders are so arranged that the chambers are flushed each time the valve is operated. In case the water in the penstock is exceedingly dirty the valves may be operated by pressure from any available outside source, since the amount of water actually required to operate the valve is small. For remote electrical control an indicator board is so arranged at the operating stand that the position of the plunger is shown at all times.



Section Through "W-S-M" Balanced Plunger Valve.

The water passages of the valve are so shaped as to conform to the natural flow of the water. There are no pockets, sudden changes of direction, or obstructions to create a loss in head. The features of the "W-S-M" balanced plunger valve make it suitable for protection of high-pressure water mains. It is stated that this valve can be positively closed in flowing water sufficiently slow to meet waterworks demands.

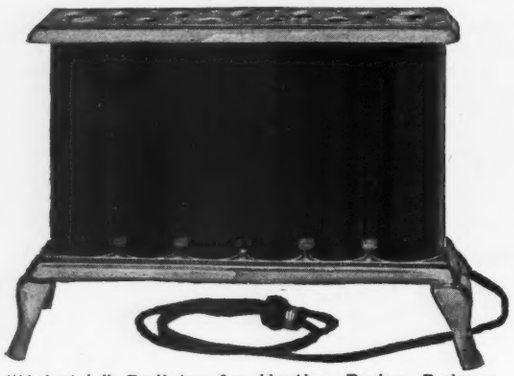
A New Development in Electric Radiators.

"What the Mazda means to light, the 'Halectric' means to heat." So says a recent catalog of the Hale Electric Manufacturing Co., 1071 Power avenue, Cleveland, maker of this new heating device.

"Halectric" radiators are built on the basic principle of the circulation of warm air. This is the fundamental principle of all heating. It is the only way that any room can be heated economically and quickly. When the "Halectric" radiator is turned on the air surround-

ing it is at once heated, and rises. This atmospheric action tends to produce a vacuum, into which the cold air rushes from below, thereby starting circulation. It is this constant process that heats the room.

A great advantage of this heater is the fact that it is made fool-proof which precludes any attempt on the part of the family tinker to remanufacture the product. No fanciful claims are made by the manufacturer, who, in turn, wishes the dealer to state simply the facts, as it is felt that the product will sell itself. Its advantages over gas or steam lie in the fact that there is no water leakage as with the steam and no fumes or low pressure as with the gas. It is the assertion of the manufacturer that the "Halectric" will give 10% more heat than a steam radiator of the same size.



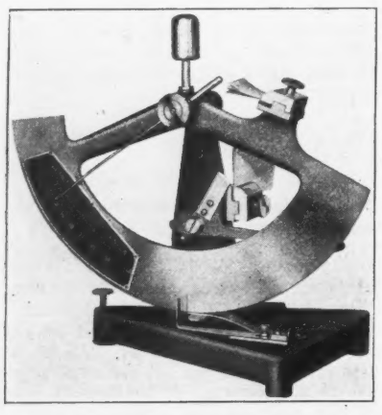
"Halectric" Radiator for Heating Parlor, Bedroom or Office.

The "Halectric" is handsome in appearance, constructed of quality materials, contains a practically indestructible element, is carefully tested, packed and crated.

The Hale company is backing these radiators with a sound merchandising policy, jobber protection, helping the dealer, and an aggressive advertising campaign to create business.

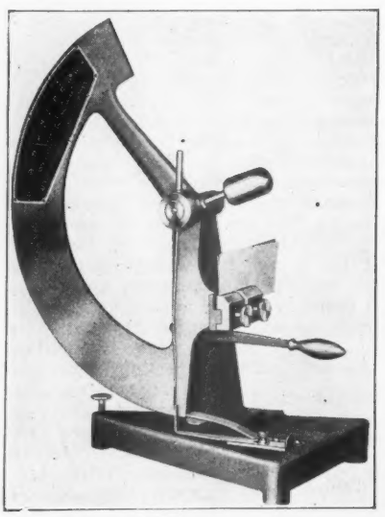
Device for Measuring Strength of Insulating Papers.

The Elmendorf paper tester is an instrument which was developed at the U. S. Forest Products Laboratory. This device is manufactured by the Thwing Instrument Co., 3339 Lancaster avenue, Philadelphia. It is stated that this paper tester measures with accuracy and very quickly the tearing strength of all grades of paper, and is suited for measuring the strength of insulating papers. It is in use for this latter purpose by the Standard Underground Cable Co. at Perth Amboy, N. J.; Electrical Testing Laboratories, New York City; Habirshaw Electric Cable Co., Yonkers, N. Y.; Safety Insulated Wire & Cable Co., New York City, and the John A. Roebling's Sons Co., Trenton, N. J.



Tester Showing Torn Specimen With Pointer Indicating Force.

Some of the main features of the Elmendorf paper tester are thus described by the manufacturer: It is a common practice to judge the strength of paper by tearing it with the hands. The Elmendorf tester does the same thing but measures the average force required to tear a considerable length of the paper. How it does this is shown in the accompanying illustrations. A strip of heavy paper, or several strips of lighter paper, are first cut to a standard width on a simple paper cutter provided with a gage. The swinging sector of the instrument is lifted 70 deg. and rests against the spring stop. The samples are dropped into the two jaws and clamped fast by the set screws. The right hand jaw is part of the fixed support. It corresponds to the thumb and finger of the right hand. The left hand jaw, which corresponds to the thumb and finger of the left hand, is attached to the moving sector.



Elmendorf Paper Tester With Specimen in Position Ready to Be Torn.

With the specimen in place the knife handle is depressed cutting a split in the specimen which determines an exact length left to be torn. The friction pointer is set against a fixed stop and the spring stop released, allowing the sector to descend by gravity and tear the paper. Owing to the resistance offered by the paper the sector will not swing to 70 deg. on the opposite side, but to a position depending only on the strength of the paper and the length of the tear. This position is shown on the dial by the pointer. By again setting the sector and pointer and moving the specimen an inch to the left the test may be repeated in a few seconds. Three or four such tests can be made in 2 min.

Papers of uniform strength will give repeated indications agreeing very closely. The uniform indications of the instrument are easily shown by releasing the sector with no specimen in place. The pointer will invariably read zero.

Portable Safety Telephone Set of Practical Design.

The Doble safety portable telephone, briefly described, consists of a small box inclosing a telephone and its protective apparatus with terminal horns for connecting to the telephone-line conductors, an insulating tube 5 ft. long extending from the box to the operator and suitable ear and mouth pieces at the operator's end of the tube.

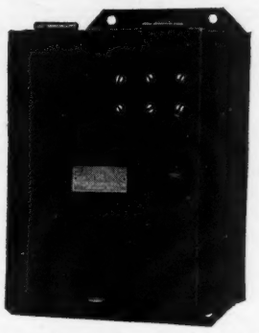
There is no metallic connection between the box and the operator, and his end of the insulating tube may be grounded if it is thought necessary to give additional safety over that afforded by 60 ins. of impregnated material good for 10,000 volts per in. A separate switch-stick, having the same insulating value as the tube, is used by the operator to throw a switch in the telephone box. This switch connects the telephone set to the line for talking and listening, or sends out an interrupted stepped-up current for signalling purposes, or in a third (stand-by) position cuts out the telephone instrument except that part for receiving signals from another station. In the direct method of connection, the contact horns are connected directly to the telephone box, and the operator uses the insulating tube as a switch-stick to engage the horn with the telephone line conductors. In the second or indirect method of connection, the contact horns are connected to a spreader on a separate insulated stick which is used to engage them with the telephone line conductors. A pair of wires connects the contact horns to the telephone box and supports it at a safe distance from direct contact with the operator. The other end of the tube is easily accessible to the operator standing on the ground.

The Doble safety portable telephone will give better service, under ordinary and parallel conditions, than other regular telephone equipment, it is said, and under extreme conditions, which subject the telephone lines to high voltage due to induction or direct contact with live transmission wires, the Doble is safe to operate, and will give results under conditions which not only render other types of telephone equipment inoperative, but may destroy the equipment and endanger the lives of the operators. This equipment is made by the Doble Engineering Co., Boston.

Rooney Pump & Transmission Co., 22 William street, New York City, which was recently incorporated with a capital of $50,000, will manufacture pumping equipment and kindred products. Among those interested are P. J. Rooney, S. Shookoff and M. B. Salzberg.

New C-H Automatic Starter Has Novel Overload Relays.

The new C-H 9604 automatic starter, with small a-c. squirrel cage motors, developed by the Cutler-Hammer Manufacturing Co. of Milwaukee and New York, is of the 3-pole contactor type

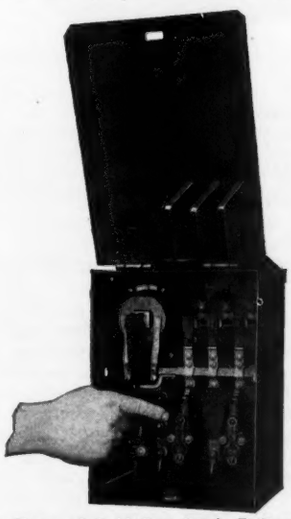


New Type of C-H Overload, Relays Closed.

arranged for use with a push-button station supplied with it.

The closing and opening of the circuit to the motor is governed by the push-button station which may be installed at a point convenient for the operator. Below the contact fingers, as shown in the illustration, Fig. 2, the new type C-H mercury overload relays are mounted. The thermal element is in series with the motor circuit, and the mercury column is a part of the pilot circuit of the magnet switch coil.

These relays widen the application of motors of this widely used type because while giving positive protection against burn out troubles, they insure good starting torque by permitting generous starting current for a period of several seconds. Fuse troubles and expense are eliminated; momentary overloads are



New Type of C-H Overload, Relays Open.

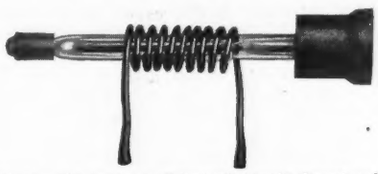
allowed but at the first sign of harmful overloading the motor is shut down.

This new C-H overload relay consists of a glass tube carrying a mercury column, one section of which is surrounded by a thermal element. The element is heated in the same proportion as the motor windings. Excessive current passing for too long a period heats the coil, causes the mercury to boil and the vapor to pass up into a chamber at the top of the tube. This breaks the liquid mercury column and opens the circuit to the magnet coil. As this coil is de-energized, the contact fingers drop away and disconnect the motor from the line.

After an interruption the thermal elements cool down. The mercury becomes liquid again and drops down into the tube, forming a column through which current to the magnet will pass again after the control button is depressed. Until the overloads reset themselves the motor cannot be started.

To obtain the temperature necessary to boil the mercury the amount of energy that must be put into the heater is in proportion to the heat radiated. Since the heat radiated is directly proportional to the temperature difference between the heater and the surrounding air, the amount of energy, and therefore the current required to operate the relay, increases with the decrease in temperature of the surrounding air. The heat capacity of the thermal element produces the desired time lag between an overload in the protected circuit and the operation of the relay.

Briefly, this relay does not trip, on account of a momentary overload, and cause unnecessary interruption and expense. It allows the motor to start a reasonable load but protects it against



Motor Cannot Be Started Until Overloads Reset Themselves.

damage due to overheating. If the motor and starter are installed in a cool location, the relay takes this fact into account and allows a greater starting current, or a greater or longer overload than if the temperature of the surrounding air were higher. A relay of this type may be mounted near the motor in place of a thermo-couple where the motor is located in a hot place.

Household Appliance Literature on Vacuum Sweeper.

The Hamilton Beach Manufacturing Co., Inc., Racine, Wis., manufacturer of motored appliances, has issued a booklet entitled "How to Sell Hamilton Beach Vacuum Sweeper," which is being distributed to all jobbers and retailers' salesmen on request. For the retailers' salesmen who actually demonstrate the Hamilton Beach vacuum sweeper there is available a complete demonstrating outfit consisting of a piece of carpet, envelopes containing the three classes of dirt ordinarily found in the carpet and a copy of the booklet above mentioned.

Electric Buffing Machine for Tire Repairing Work.

The Stewart electric buffing machine marketed by the Chicago Flexible Shaft Co., Roosevelt road and Central avenue, Chicago, is designed for use in tire buffing work and is recommended for buffing both the inside and outside of large truck tires. The machine is equipped with a leather covered flexible shaft 49 ins. in length, connected to the motor by a cog-driven universal joint.

The manufacturer states that the Stewart electric buffing machine is furnished

Stewart Electric Buffing Machine.

with a 0.25-hp. motor which swivels 360 deg. and is mounted on a low stand; handle for motor, leather covered flexible shaft 49 ins. in length, with bronze hand piece, equipped with 4 by 1-in. wire buffing brush and 15 ft. of cord ready to attach to suitable outlet.

Monorail Hoist as Means of Reducing Production Costs.

In these days when the executive is confronted with the problem of economical production, many designs of inter-department conveying and transferring equipment have been introduced to aid in the solution of this problem. In the face of this keen competition there seems to be a decided preference among steel mills, foundries, power plants, freight terminals, warehouses, and docks for the electric monorail hoist equipment, says Arthur Fritsch, vice-president of the Milwaukee Electric Crane & Manufacturing Co. The outstanding advantage of this equipment is that no floor space is taken up, though it efficiently utilizes overhead space that could not be used otherwise. Being overhead, it is out of the way and possesses the additional feature of passing over various equipment, a feat that it would be impossible to perform with any other type of conveying equipment. Furthermore, the hoist will track along the monorail, if necessary, pick up the load at one extreme of the plant and carry it and put it down at the other. This is accomplished by the use of only a single operator in the traveling cage who controls every operation, and is thus enabled to do the work of many in but a fraction of the time. Naturally, production is increased and the cost of handling is reduced to a minimum.

On the face of things it might seem that these monorail hoists have an easy thing of it, on the contrary, they are actually subjected to the most severe usage and neglect. Being of small capacity, usually 3 to 6 tons, they are frequently greatly overloaded and are always in demand about the plant. Take the malleable iron foundry for instance —one moment subjected to the intense heat that accompanies charging of the

air furnaces, a moment later it may be found pulling loose the slag or bringing in coal from the yard or delivering castings, cores, sand, etc., in fact, it is on the go all of the time. About the only time it gets any oil or care is at the week-end and sometimes very little then. Consequently the construction must be of a heavy duty type to give continuous service. To successfully meet these conditions the Milwaukee company has developed and perfected a hoist of sturdy, dirt-proof, fume-proof, and moisture-proof construction with all working parts automatically lubricated. It is this protection that makes it economical to operate and easy to maintain. The larger bridge-crane has not a thing on this compact monorail hoist, one view of which is shown in Fig. 1, for every feature of the bridge crane has been embodied in this hoist. It possesses a strong foot brake for stopping the hoist, a very simple and powerful electrical motor brake as practical as the brakes on its larger brother, the bridge crane.

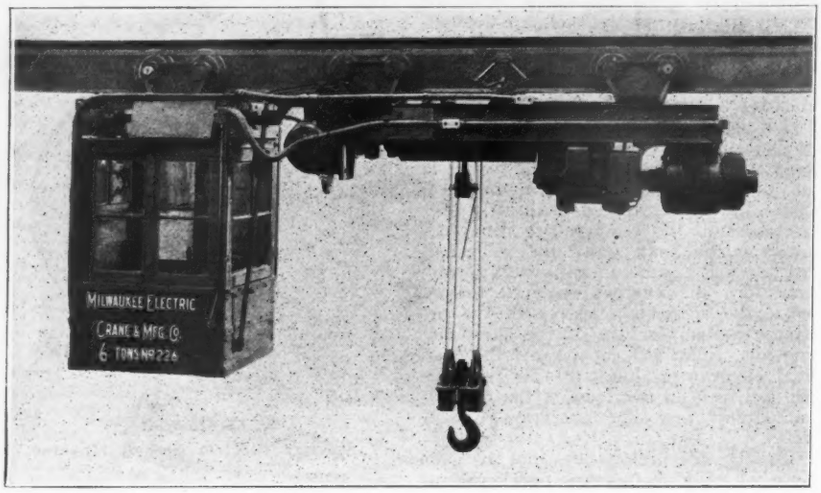


Fig. 1.—Compact Monorail Hoist Has All Advantages of Bridge Crane.

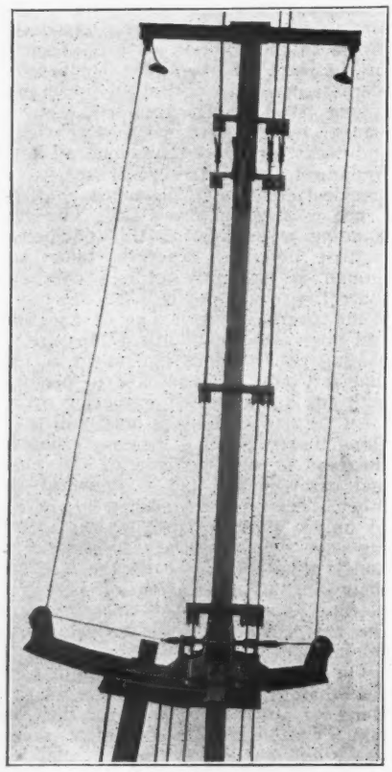


Fig. 2.—A Fair Idea of the Ideal Switch May Be Obtained.

It is possible to use alternating or direct current with this equipment, which is provided with the necessary current collectors for switchboard attachment of the most advanced type for safety and continuous service.

Another valuable asset of monorail hoists is the double truck method of suspension, each truck having 4 wheels, with the power applied to each wheel of the driving truck. This arrangement makes it possible to operate on small radius curves, which is very desirable when installing the monorail system in an oil plant having many sharp turns. Owing to this flexibility you find these hoists successfully operating on many curves, switches and transfer spans.

As the monorail hoists can only be efficient as the monorail system of switches employed, naturally a word about their proper construction may be of interest to those who are considering their installation. By referring to Fig. 2, a fair idea of an ideal switch may be obtained. It is of a design that can be built for any radius or throw desired and consists of a movable beam pivoted at the end, and a movable carriage with two roller bushed wheels operating on a track at the other end. This gives very easy operation by ropes attached to the movable carriage which lead back to the switch approaches. Should the operator fail to completely throw the switch, the positive safety locks and pawls that are provided would prevent any disaster, such as the hoists leaving the rail.

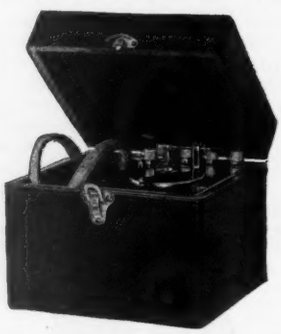
Expansion of the runway beams must be provided for at the switches and this is satisfactorily taken care of by tower caps which make the switch a self-contained unit and prevents the beams from jamming.

The fact is through the test of time and hard usage these sturdy little overhead giants have proved their possession of the great reliability and durability that enables them to withstand continuous service at relatively high-speed travel with low repair costs which tends toward economy in production. They give you the advantage of the bridge crane plus the ability to deliver the goods in every part of the plant.

New Radio Receiver Developed by Westinghouse Company.

The latest development in radio receivers has just been placed upon the market by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., under the trade name of "Aeriola, Jr." This is a complete radio receiving outfit which weighs only 5 lbs. and may be carried with ease. To use this outfit it is only necessary to connect it to a single-wire aerial and a ground. No additional equipment is needed, for the receiver includes all the essentials—a variable tuner, a fixed condenser, a supersensitive crystal detector and a high grade set of head phones.

This outfit is a single-circuit receiver, involving a variometer tuner with fixed series condenser. The detector is sensitive at all points, assuring easy and dependable operation. A single indicating arm operating over a graduated dial assures quick and accurate tuning for telegraph or telephone stations within its range of 190 and 500 meters. The head phones are connected to the usual stopping condenser. A special compartment is provided in the case for the head phones, so that the unit is always complete and ready for instant use. Folder No. 4465, issued by the Westinghouse company, illustrates and describes this unit.



"Aeriola, Jr." Radio Receiving Outfit.

Cartoon Gives "Reason Why" for Spotlights.

The night was dark. The road was strange. At the cross-roads they hesitated, uncertain. Ah, a sign post! Painfully he climbs it and strikes a match. "What does it say, dear?" she asks from the front seat of the car. "It tells us to drink some darn fool grape juice." And the next day she bought him a new "Eveready Spotlight," the flashlight with the 300-ft. range, so he could read road signs from the seat of his car.

This story, so pathetically true, as every motorist will testify, and cartooned in *Life*, the humorous weekly, is the basis of an ad which the American Eveready Works, Long Island City, N. Y., is using to boost the sale of its new spotlight. Every man or woman who has ever driven a car on strange roads at night will get the moral of the story at a glance, and the company expects it to boost spotlight sales tremendously.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Radium Luminous Materials Co., Orange, N. J., has filed plans for improvements in its plant on Alden street.

Cooper Battery Co., Jackson,Tenn., of which R. L. Beare is president, plans to rebuild its plant recently destroyed by fire.

Dallas Brass & Cooper Co., 820 Orleans street, Chicago, has issued a new July, 1921, folder and price list of lighting fixtures.

Battery Service Co., Muskogee, Okla., manufacturer of storage batteries and equipment, plans to erect a 1-story factory, 110 by 170 ft.

Electric Utensils Co., 1405 South Hill street, Los Angeles, plans to manufacture electrical specialties. Kenneth H. Woolson, 910 Third street, heads the company.

Ideal Electric Dumbwaiter Co., Buffalo, N. Y., was recently organized with a capital of $50,000, the incorporators being G. A. Irwin, J. D. Hillery and J. N. Wechter.

Landers, Frary & Clark Co., New Britain, Conn., has commenced production at its new plant at New Hartford, to be used for the present primarily for vacuum cleaner manufacture.

Usona Manufacturing Co., 826 South 18th street, St. Louis, manufacturer of electrical specialties, plans to erect a 1- and 2-story plant, 100 by 150 ft., at Chouteau and Spring streets.

Muskegon Piston Ring Co., Muskegon, Mich., was recently organized to manufacture piston rings of iron and steel. Those interested are George W. Olson, John R. Nix and A. Kitzinger.

Kinsey-Davidson Electric Welding Co., 208 Mayer building, Milwaukee, has changed its name to the Davidson Electric Welding Co., following the purchase of the interest of John I. Kinsey by W. B. Davidson.

American Accumulator Co., Owatonna, Minn., manufacturer of electric storage batteries, plans to erect a 1-story plant, 90 by 106 ft., contract for which has been awarded to Hammel Brothers & Anderson, Owatonna.

M. G. Miller Manufacturing Co., Columbia City, Ind., which was recently organized, plans to manufacture refrigerators and similar equipment. M. G. Miller, A. J. Freed and Lloyd Crouch are interested in the company.

Edison Electric Appliance Co., Inc., 5600 West Taylor street, Chicago, has issued a "Service Manual" for use of its dealers and jobbers, the object of which is to provide a ready reference to its policy and facilities for servicing its products. These include the electrical heating devices formerly manufactured by the Hughes Electric Heating Co., Hotpoint Electric Heating Co., and by the domestic device department of the General Electric Co. The manual is designed to be used by customers as a permanent guide because it forms the basis for subsequent issues of supply part catalogs, and gives accurate information in regard to the service stations maintained by the company. Under the supervision of J. F. Roche, advertising manager of the company, and service station supervisor, who established most of the stations and organized the personnel, the function of the stations has been widened so that each station maintains a complete display of all devices manufactured by the company. It is the ideal of the company to make each service station a model store from which dealers can gain ideas for window display and store layout Service stations are conveniently and centrally located at Atlanta, Ga.; Boston; Chicago, (factory); Chicago, (local); Dallas, Tex.; Los Angeles; New Orleans, La.; New York City; Ontario, Cal.; Portland, Ore.; San Francisco; Salt Lake City, Utah; St. Louis, and Seattle, Wash. The company plans to establish other stations from time to time.

American Grinder Manufacturing Co., Milwaukee, manufacturer of portable grinders, tools, etc., plans to move its plant to the second floor of the Terminal building, where a long term lease has been secured on 40,000 sq. ft. of space.

Link-Belt Co., 910 South Michigan avenue, Chicago, has issued a new steel chain data book, No. 475, which describes the heavier rugged steel chains used for power transmission, together with elevating and conveying chains.

Foster-Songer Co., Park building, Pittsburgh, has announced the appointment of William T. Dunn, 10 High street, Boston, as district sales agent for the company's line of pipe and seamless tubing in the New England territory.

Wonder Recharger Co., of Canada, Ltd., Montreal Que., which was recently incorporated with a capital of $150,000, will manufacture electrical machinery, etc. Among those interested are S. C. Demes, John W. P. Ritdue and Leslie G. Bell.

Russell Electric Co., 140 West Austin avenue, Chicago, manufacturer of electrical appliances, has announced that Paul C. Bandy is now manager of its industrial heating department, the company having recently entered the industrial heating field in an extensive way. Mr. Bandy formerly handled the sales work in the industrial heating department of the Cutler-Hammer Manufacturing Co. in the Western district. The industrial heating line of the Russell Electric Co. will carry the "Hold-Heet" trade name, the line including standard and special space heaters, steel-clad conduction heaters for practically every heating purpose, industrial immersion heaters, chocolate warmers, glue pots, solder pots and all types of special heating units.

Belden Manufacturing Co., 2300 South Western avenue, Chicago, has issued a 4-page net price list on various grades of lamp cord and insulated wires. The list is the first issue of a monthly bulletin service designed to show the current net price of the wires and to obviate the need for figuring discounts and differentials in estimating costs. Brief specifications of each grade of wire are given.

National Foreign Trade Council, of which O. K. Davis, 1 Hanover square, New York City, is secretary, has recently issued a pamphlet on the "Commercial Possibilities of the Union of South Africa," which contains a survey of the recent industrial expansion and the mineral and agricultural resources of a market presenting great possibilities for American enterprise. A copy of the pamphlet may be obtained free on request from Mr. Davis at the address mentioned above.

Conveyors Corporation of America, with headquarters at 326 West Madison street, Chicago, has in the mails a beautifully designed "Proof of the Pudding," which consists of letters from users of ash handling equipment. April 19 A. L. Currey, president, wrote a letter to 1200 users of installations of the American Steam Ash Conveyor system, asking specifically for complaints regarding the operation of the conveyor. He asked for kicks and received instead letters of commendation. Of these replies 70 have been gathered into a booklet which is given the title heretofore referred to. If you have not seen a copy, one will be mailed for the asking.

Allied Machinery Co. of America, 51 Chambers street, New York City, has been appointed foreign representative in all countries except the United States and Canada for the Universal Crane Co., of Elyria and Cleveland, O. The Allied Machinery Co. has offices in all the large countries of the world. The Universal Crane Co.'s general offices are in the Swetland building, Cleveland. Its product is a 3 to 4-ton portable gasoline or electric locomotive crane for mounting to suit working conditions. The Universal crane is now being used mounted on a motor truck in the electric street railway industry—coal and building supply work and contracting, handling dirt, coal, iron, sand, gravel, etc. Very nearly any industrial condition can be met by the crane on one of its mountings—an industrial truck to serve large plants, foundries or scrap yards and others; a railroad flat car mounting for the railroad field.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

E. L. FISHER, general manager of the Muscatine (Ia.) Lighting Co., has been appointed general manager of the lines of the Tri-City Railway Co. in Muscatine.

W. J. CRAWFORD, formerly sales engineer of the Cutler-Hammer Manufacturing Co., has become connected with the Electric Storage Battery Co., New York City.

ISAAC HARTER has been appointed general superintendent of the Babcock & Wilcox Co., 85 Liberty street, New York City, to succeed the late James P. Sneddon.

COLIN K. CARR has joined the operating department of the Commonwealth Edison Co., Chicago. He was formerly connected with the Firestone Tire & Rubber Co.

W. S. GIFFORD, vice-president of the American Telephone & Telegraph Co., 195 Broadway, New York City, has been elected a director of the American Surety Co. of New York.

J. B. ADAMS, formerly connected with the Standard Insulation Co., Rutherford, N. J., has become sales manager of Schweitzer & Conrad, Inc., 4431 Ravenswood avenue, Chicago.

H. H. HORNING has joined the power engineering department of the Philadelphia & Reading Coal & Iron Co., Pottsville, Pa. He was formerly with the Cutler-Hammer Manufacturing Co., Milwaukee.

C. A. MALINOWSKI has resigned as electrical foreman of the Magna plant of the Utah Copper Co., and has accepted a position with the Westinghouse Electric & Manufacturing Co., Salt Lake City, Utah.

M. A. MAXWELL has resigned as general manager of the Logan County Light & Power Co., Logan, W. Va., to become vice-president and general manager of the Beckley Pocahontas Coal Co., Huntington, W. Va.

VINCENT J. WOODCOCK, formerly manager of the electric fixture and appliance departments of the Economy Electric Co., Worcester, Mass., has accepted a position with the Crowe-Woodcock Co. of the same city.

DANIEL N. BATES, traffic manager of the American Steel & Wire Co., Worcester, Mass., has been retired on a pension after 36 yrs. service with the company. He has been succeeded by Arthur D. Fiske, assistant division freight agent.

W. B. PIERCE, who is eastern sales manager of the Edison Electric Appliance Co., Inc., New York City, has been engaged in the electrical business for the past 15 yrs., starting his career in the purchasing department of the Manhattan Electrical Supply Co. in Chicago. From there he went to the Kansas City (Mo.) Electric & Telephone Supply Co. in the capacity of sales manager. He later became manager of the specialty department of the Western Electric Co. at Chicago, and was instrumental in opening the house-goods department of that company. This department handled socket appliances, washing machines, vacuum cleaners, etc., and conducted the

W. B. Pierce.

first campaign that the Western Electric Co. inaugurated on washers on the time-payment plan. After occupying this position for about 7 yrs. Mr. Pierce was appointed the eastern and New England representative of the Hughes Electric Heating Co., and opened offices in Boston, handling the pioneer work of the Hughes range in that territory. In the fall of 1917 he went to Washington and conducted for approximately 14 mo. the Edison Electric Appliance government office, which handled the development of the various items the Edison Electric Appliance Co. manufactured for war work, such as electrically-heated aviators' clothing, machine gun heaterrs, ship-type heaters and other devices. Later he was appointed eastern district sales manager of the company with offices in New York City.

G. W. BORST, who for the past 8 yrs. has acted as electrical engineer for the Chicago Fuse Manufacturing Co., has severed his connection with that firm and expects to spend the summer out of the city, returning again about Sept. 1. His plans from then on have not as yet been definitely formulated. Mr. Borst is an electrical engineering graduate of the Armour Institute of Technology. After receiving his degree he spent several years with the Westinghouse Electric & Manufacturing Co. in the main factory, various branches of the engineering department and on outside erection work, in which he was in charge of large crews in Camden and Baltimore in work touching upon multiple-unit systems of control for cars and locomotives. In 1910 he became connected with the Western Electric Co., where he remained for 3 yrs., leaving in 1913 to join the Chicago Fuse Manufacturing Co. In the latter position his principal duties were along the lines of fuse development, but his duties also covered work on factory costs, estimating and advertising. He also played an active part in outlet box standardization.

J. L. BROWN, chief engineer of the Waterside power station of the Louisville (Ky.) Gas & Electric Co., for the second time has been chosen president of the Louisville section of the National Association of Stationary Engineers.

MAJOR GEORGE A. DAVIS, assistant to the vice-president of the Oklahoma Gas & Electric Co., Oklahoma City, Okla., has been selected by the American Legion to represent the state of Oklahoma in the delegation consisting of one soldier from each state who will go to France Aug. 3 for the unveiling of the U. S. Monument on the St. Mihiel battlefield.

GERARD SWOPE, president of the International General Electric Co., and OWEN D. YOUNG, vice-president of the General Electric Co., returned July 19 from a 4-mo. tour in the Orient, visiting Japan, China and the Philippines. They received most friendly greetings from the leading officials and business men, and believe that the commerce of the United States is destined to greatly expand in these countries.

BERNARD J. FALLON has been appointed general manager of the Chicago Elevated Railroads. He is a member of the Western Society of Engineers and began his railroad career as a rodman with the Chicago, Burlington & Quincy Railroad Co., later becoming superintendent of track elevation work. In 1907 he entered the service of the Metropolitan Elevated road as engineer of maintenance of way and was appointed assistant general manager 2 yrs. later. When the elevated roads were brought together under joint operation in 1911 Mr. Fallon became engineer of maintenance of way of the unified system.

OBITUARY.

DR. FRANK W. BRANDOW, one of the founders of the J. & B. Manufacturing Co., Pittsfield, Mass., manufacturer of electrical specialties, and well known as an inventor and mechanician, died recently at the age of 68 yrs.

FRANCIS REED, founder of the Francis Reed Co., Worcester, Mass., manufacturer of drilling machines, died July 11, aged 69 yrs. He learned the machinist trade in Manchester, N. H., going to Worcester in 1880, and 5 yrs. later formed a partnership under the name of Reed & Page, which carried on an electrical business. In 1889 he took over the business of George Burnham, which developed into the Francis Reed Co.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Boston, Mass.—The Boston Elevated Railway Co. has filed plans for extensions and improvements in its power plant at 365 Commercial street.

Fitchburg, Mass.—The Fitchburg Gas & Electric Co. has been granted permission by the State Department of Public Utilities to issue stock in an amount of $678,865, to be used in connection with general operations and to defray the cost of certain plant extensions.

Worcester, Mass.—The New England Power Co., 35 Harvard street, has sold a bond issue of $1,250,000, the proceeds to be used for the construction of a power plant. The new generating station will be shown as Plant No. 9, and will be equipped for an initial capacity of about 5000-hp. The company is now operating a total of five hydrooelectric generating plants, with aggregate rated output of 48,000-hp.

Hartford, Conn.—Electrical equipment will be installed in the 2-story mechanical laundry plant to be erected by the Department of Health and Charity on Holcomb street, with cost estimated at $80,000.

Pawtucket, R. I.—A 1-story power house will be erected at the plant of the Moore Fabric Co., Washington street. Considerable electrical equipment will also be installed in the addition now being constructed to the main mill.

Phenix, R. I.—The addition to be erected by the Pawtuxet Valley Dyeing Co., estimated to cost about $75,000, will include the installation of considerable electrical equipment for general operation. J. Bamford Bennett is superintendent.

Amsterdam, N. Y.—Considerable equipment will be installed in the proposed 6-story carpet mill to be constructed by the Mohawk Carpet Mills, Inc., McCleary, Wallin & Crouse branch, on Lyon street, estimated to cost $300,000.

Binghamton, N. Y.—The Achilles Rubber & Tire Co. has commenced the installation of new transformers and other electrical equipment at its plant.

Brooklyn, N. Y.—The Queensboro Gas & Electric Co. has filed notice of increase in its capital stock from $2,000,000 to $7,000,000.

Buffalo, N. Y.—The Lower Niagara River Power & Water Supply Co., and Niagara Gorge Power Co., affiliated with the Niagara Gorge Railroad Co., have made application to the Conservation Commission for permission to utilize water in the Niagara Falls gorge for electric power development. Plans are under way by the companies for the construction of hydroelectric generating stations on selected sites.

New York, N. Y.—The New York Edison Co., 130 East 15th street, has awarded a contract to the North Eastern Construction Co., 101 Park avenue, for the erection of a 1-story addition, 63 by 94 ft., at its Waterside power plant, 40th street and First avenue, estimated to cost $125,000. William Whitehill, 12 Elm street, is architect. The company has also filed plans for extensions and improvements at its automobile service works and repair snop at 125 West 52nd street, to cost about $20,000.

Oswego, N. Y.—A 1-story power house will be erected at the plant of the Oswego Shade Cloth Co. Contract for construction has been let to W. A. Barlow, West Fourth street.

Pearl River, N. Y.—Electrical equipment will be installed in the proposed 2-story addition to be erected at the local plant of the Dexter Folder Co., manufacturer of paper folding machinery, etc.

Rochester, N. Y.—The Rochester Gas & Electric Co. has disposed of a bond issue of $7,000,000, the proceeds to be used for plant extensions and betterments, general operations, etc. Robert M. Searle is president.

Syracuse, N. Y.—The Iroquois Utilities, Inc., City Bank building, has made application to the Public Service Commission for permission to erect an extension to its electric power plant in the town of Concord, N. Y.

Syracuse, N. Y.—In connection with the new plant of the Atmosheric Nitrogen Co., at Solvay, near Syracuse, now nearing completion, extensive electric service is planned, and with the erection of additional plant units, as now being arranged, the plant, it is said, will be the largest consummer of electric energy in the central New York district. Electric service will be furnished over a high tension line from Niagara Falls.

Watertown, N. Y.—The Northern New York Utilities, Inc., has sold a bond issue, the proceeds to be used for plant extensions and improvements and general operations. The company is now operating generating stations with a total capacity of about 30,000 hp.

Butler, N. J.—The Board of Public Utilities has granted permission to the Common Council to issue bonds for $10,000 for extensions in the municipal electric power plant.

Glassboro, N. J.—The Common Council is considering plans for changing the present gas-lighting street system to an electric-lighting system. Service in event of the change will be rendered by the Public Service Electric Co.

Gloucester, N. J.—The City Council has approved plans for the construction of an electric power plant to be used for waterworks operation, and new electric pumping machinery, new filtration plant and other improvements for the water department, estimated to cost $202,000. Remington & Vosbury, Camden, N. J., are engineers.

Jersey City, N. J.—Electrical equipment will be installed in connection with the 15-ton and 5-ton ore unloaders to be erected by the Lehigh Valley Railroad Co., at its property at the foot of Chapel street, estimated to cost $500,000.

Madison, N. J.—The Borough Council will make a number of improvements at the municipal electric power plant, operated in conjunction with the local waterworks. Repairs will be made to equipment.

Milford, N. J.—The Common Council is planning extensions in the street-lighting system to include an all-night service.

Newark, N. J.—Considerable electrical equipment will be installed by the Board of Education in the proposed additions to be erected to the public schools on Charlton and Elliott streets, estimated to cost $285,000 and $276,000, respectively.

Newark, N. J.—The Public Service Gas Co. has filed plans for extensions and improvements in the engine department at its works on Congress street.

Wilmington, Del.—Electrically operated freight handling machinery, hoisting machinery, etc., will be installed at the docks and terminals to be constructed by the Board of Harbor Commissioners. Bids for the dock construction have been taken, with low bid received from the Hughes-Foulkrod Co., Commonwealth building, Philadelphia, at $1,311,000. A total appropriation of $1,800,000 is said to be available for the work.

New Albany, Pa.—The Public Service Commission has approved the sale of the New Albany Light, Heat & Power Co. to the Sullivan County Electric Co. The system will be merged with that of the purchasing company.

Connellsville, Pa.—The Hood-Sullivan Electric Co. has been incorporated with a capital of $5000 to operate a local light and power system.

Frackville, Pa.—The Pennsylvania Power & Light Co., Allentown, Pa., has commenced the installation of a new local substation. The company has recently extended its transmission system from its generating plant at Hauto to this place.

Glen Rock, Pa.—The Enterprise Furniture Co. will break ground at once for the erection of the proposed power house at its works.

Glen Rock, Pa.—The Glen Rock Electric Light & Power Co. has per-

fected plans for the merger of 11 electric utilities, recently organized, to operate in the future under the control of the Glen Rock company. This company is headed by J. Victor Wambaugh, E. B. Keller and P. L. Hedrick.

Hamburg, Pa.—The Richmond Light Co. has been incorporated with a nominal capital of $5000, to operate a local light and power system. H. R. Shollenberger is treasurer.

Hanover, Pa.—The General Gas & Electric Co. has been incorporated with a nominal capital of $5500, to operate a local light and power system. W. F. Kintzing is treasurer.

Harrisburg, Pa.—In connection with negotiations with the Harrisburg Light & Power Co. for the installation of additional equipment at its plant for increased efficiency and service, the Common Council is said to be considering tentative plans for the establishment of a municipal electric plant to handle the demands of the entire municipality.

Philadelphia, Pa.—Plans for the construction of a power house have been filed by W. H. and E. A. Margerison & Co., Jasper and Huntingdon streets, manufacturers of textile products.

Philadelphia, Pa.—The American Motor Body Co. has filed plans for the erection of an addition to its power house on Glenwood avenue.

Philadelphia, Pa.—The Merz Worsted Co., Indiana avenue and A street, has filed plans for extensions of its power house.

Pittsburgh, Pa.—The Duquesne Light Co., 435 Sixth avenue, is arranging for an increase in its capital stock from $34,822,300 to $59,822,300. W. B. Carson is secretary.

Pittsburgh, Pa.—The Public Service Commission has approved contracts for street-lighting for a period of 5 yrs., made by the Duquesne Light Co. with the boroughs of Millvale and North Clairton, and Baldwin township.

Scranton, Pa.—The Scranton Electric Co. is planning the immediate repair of its transmission and distributing system, recently damaged by storms.

Eckhart, Md.—The Common Council has closed negotiations with the Hagerstown & Frederick Railway Co., Hagerstown, Md., for the extension of its lines to this point, and the installation of a local light and power system.

Frostburg, Md.—The City Council has awarded a contract to the Hagertown & Frederick Railway Co., Hagerstown, Md., for furishing local light and power service for the installation of new electrically operated pumping machinery at the waterworks pumping station on the Savage river.

Sharpstown, Md.—Fire recently destroyed the local ice-manufacturing plant and a portion of the waterworks, with loss estimated at $17,000. The structures will be rebuilt.

Upper Marlboro, Md.—The Chesapeake & Potomac Telephone Co. has work under way on extensions and improvements in its rural lines in St. Mary's, Prince George's and Montgomery counties. About 225 miles of new lines will be installed.

Clifton Forge, Va.—The Virginia-Western Power Co. has filed notice of increase in its capital stock from $1,250,000 to $4,000,000.

South Hill, Va.—The Town Council has approved a bond issue for $150,000 for an electric light and power plant, and other municipal service.

Durham, N. C.—The Common Council has approved plans for extensions in the street-lighting system on Mangum and Chapell Hill streets.

Elm City, N. C.—The council has approved a bond issue of $25,000 for extensions and improvements in the local electric system.

Lamar, S. C.—The Lamar Power & Light Co. was recently incorporated with a capital of $31,200. E. H. Segar is president; L. C. Huff, secretary, and R. P. Barry, treasurer.

Columbus, Ga.—The Board of Works is planning extensions in the street-lighting- system on Triangle street.

Lake Butler, Fla.—The Common Council is arranging for a bond issue of $10,000 for the installation of an electric light and power system.

NORTH CENTRAL STATES.

Jackson, Mich.—W. B. Burris, fair manager, has asked City Manager E. C. Meyfarth to take up with the commission the matter of the city furnishing more electric lamps for the fairgrounds.

Port Huron, Mich.—A petition is now in circulation by residents of Lapeer avenue asking for boulevard lighting. Address the mayor.

Springport, Mich.—The Springport Council will call a special election on three propositions on the lighting question; one, to build a line from Albion to Springport; another is to place new equipment in the old electric light plant and run it continuously, and the third is the proposition from Riley Starks to buy and operate the present plant.

Huntington, Ind.—This city is to furnish electricity for North Manchester, according to the terms of a deal recently closed by which the Brown-Mills Electric Co. of North Manchester, will be reorganized with J. S. Bippus, of Huntington, as the chief stockholders. A line will be extended by the new company to the city limits of Huntington.

Joliet, Ill.—The Illinois Bell Telephone Co. plans to make extensive improvements in its telephone systems. Address A. H. White, general manager at Joliet.

Springfield, Ill.—The city will vote on the question of purchasing the heating and lighting plants of the Springfield Gas & Electric Co., the issuance of a franchise to the Citizens Electric Co., and the issuance of $500,000 in bonds to put the deal over. Address Albert D. Stevens, city attorney.

Eden, Wis.—The property and good-will of the Eden Telephone Co. have been purchased by H. G. Brock, who plans to make improvements to the system.

Iron River, Wis.—A crew of men were sent to work by President T. F. Mackmiller, of the Iron River Water, Light & Telephone Co., putting the power dam in this city in first class shape and remodeling the same for the installation of a waterwheel to make use of the waste water. Other necessary machinery will be installed so as to be able to put the extra power to good use. The company recently purchased a tract of land at the outlet of Iron river and will erect a reservoir for the storage of water to be used for power purposes when the river is low.

Oconto, Wis.—The Oconto Light & Power Co. has been incorporated. This is a part of the general plan to separate the public service branch of the Oconto Service Co. from the power-producing end of the business. The Peshtigo Light & Power Co. and the Lena Light & Power Co. have also been organized by interested parties in their respective communities.

Adrian, Minn.—The municipal electric light plant, waterworks and pumping station were destroyed by fire recently. Address T. W. Newell, superintendent.

Corning, Ia.—Engineer C. E. Munns has prepared plans for a $60,000 municipal power plant.

Elkhorn, Ia.—Bonds to the amount of $9000 have been voted to build a transmission line from Kimballton. The Kimballton plant has been sold by its owner, Oluf Hansen, to the town of Kimballton for $12,000, contingent upon the town voting the required bonds. A special election will be called to vote on the proposal of issuing $20,000 in bonds for the purchase and improvement of the plant.

Waterville, Ia.—Bonds to the amount of $5000 have been voted to provide for electric light and power equipment. Address the mayor.

Winterset, Ia.—Bids were received July 26 for furnishing the material and machinery equipment for a new electric light plant and rebuilding the electrical distribution system. The specifications include rebuilding the engine, reinforced concrete stack, boilerfeed pump, switchboard, transformers, etc. Address city clerk.

Brashear, Mo.—The Common Council is considering the construction of a high-tensions line in the municipality, to be used for local light and power service. A transformer house will also be constructed.

Urich, Mo.—The City Council has perfected plans for a bond issue, the proceeds to be used for the installation of an electric light and power system.

Kansas City, Kan.—Bonds to the amount of $750,000 have been voted for electric light extensions. Address city electrician.

Oscola, Neb.—John L. Soderberg Co., Omaha, Neb., has the general contract for the erection of $146,000 courthouse. The total cost of the building and equipment is $181,000.

The specifications include a separate electric light plant, the cost of which is included in the total given.

Wisner, Neb.—The City Council will submit a proposition to the voters for the installation of a municipal electric power plant. Address the mayor.

Carrington, N. D.—The General Utilities Corp. plans to build a high line from New Rockford to furnish electric energy for the city.

SOUTH CENTRAL STATES.

Auburn, Ky.—The Auburn-Woodburn Electric Co. has been incorporated with a capital of $30,000 to operate a local electric light and power system. The company is headed by R. L. Stevenson.

Chattanooga, Tenn.—J. W. Cole plans to install a 2 or 3-hp., 110-volt, 60-cycle, a-c. motor. Address P. O. Box 357, Chattanooga.

Verbena, Ala.—Thomas W. Martin, president of the Alabama Power Co., Birmingham, Ala., has secured a permit from the Federal Power Commission for the erection of the hydroelectric plant at Duncan's Riffle on the Coosa river, and to construct a dam. The ultimate development will be about 60,000 hp.

Meridan, Miss.—The Acme Building Co. plans to install power-plant machinery in its sash and door factory.

Starkville, Miss.—The State Bond Improvement Commission, Jackson, has awarded a contract to the Estes, Williams, Ragsdale Co., Memphis, for the construction of a power plant at the Mississippi Agricultural and Mechanical College, to cost $49,608.

Pitcher, Okla.—The city plans to install an air-lift pump in the electric light plant. Address the mayor.

Sand Springs, Okla.—Financial arrangements by H. S. Shaner are about completed for the construction of an electric power plant.

Amarillo, Tex.—The Common Council is considering the installation of a new electric street-lighting system.

Houston, Tex.—The Houston Electric Co. has contracted with the city to expend $1,000,000 on improvements within 10 mo. after its acceptance of the new franchise, expecting to give the people better street-car service.

Sanderson, Tex.—The Sanderson Ice, Water and Light Co. has been incorporated with a capital of $50,000, the incorporators being John Kerr, James Kerr and W. H. Mansfield.

Whitney, Tex.—The Common Council is arranging a bond issue of $15,000 for the installation of an electric street-lighting system.

WESTERN STATES.

Blanca, Colo.—A hydroelectric plant on Ute creek, on the south slope of Mount Blanca, to supply water and light to the San Luis valley, is proposed by Denver capitalists. The initial project comprises an electric railway to serve the eastern and southern sections of the valley, and electric light and power lines to serve Blanca, Fort Garland, San Luis, San Acacio and other towns in the southeastern section of the valley. It woul tap rich farming sections and would be feeders for the Denver and Rio Grande and San Luis Southern railroads. It is reported that arrangements will be completed and preliminary work started early in August. W. W. Snyder and Harry Martin of Blanca have filed on the waterpower rights.

Republic, Wash.—It is reported the Washington Water Power Co. Spokane, will take its option on land around Kettle Falls on the Columbia river and will begin work on a power site soon.

Salem, Ore.—The development of 58,600 hp. in a project estimated to cost $2,000,000 is contemplated in an application filed with State Engineer Light & Power Co., covering the Cupper by the Portland Railway, appropriation of 100,000 acre ft. of water from the main fork of the Clackamas river.

City of Mexico, Mexico.—Shortage of water in the storage reservoirs of the Mexican Light & Power Co. at Necaxa in the mountains about 100 mi. from here has caused a curtailment of street light here. It is stated that additional demands for power are being made upon the company and that in order to take care of present and future needs in this respect an additional hydroelectric plant will be built as a part of the existing Necaxa system. The proposed new plant will have a capacity of 40,000 hp. The same water that passes through the present power plants will be used, it is stated. Clint B. Kearny, engineer, who supervised the construction of the original hydroelectric plants at Necaxa has been in Mexico for the last 3 mo. working out the plans for the additional unit. It will cost about $2,000,000 American money.

PROPOSALS.

Chicago, Ill.—The Chicago, Burlington & Quincy Railroad Co. will receive bids until Aug. 5 for machinery for the electrical operation of the Burlington drawbridge. Bids must be submitted and addressed to L. N. Hopkins, purchasing agent, room 1402, 547 West Jackson boulevard, Chicago.

Luverne, Minn.—Bids will be received Aug. 1 for the construction of an electric light and power line from the city limits of Luverne to the county poor farm, bids to include material as well as labor. Address Olaf Skyberg, county auditor.

Amite, La.—Bids will be received Aug. 16 for a waterworks system. The specifications include the furnishing of switchboard and motor, and installing machinery and switchboard station. Address M. R. Williams, clerk of Board of Aldermen, or Joseph Kopfler, mayor.

Washington, D. C.—A. L. Flint, general purchasing officer, the Panama Canal, will receive bids until 10:30 a. m., Aug. 3, for motors, insulators, voltmeters, switches, reflectors, receptacles, tape and other electrical and mechanical equipment for Canal Zone service, all as set forth in Circular 1453.

INCORPORATIONS

Malden, Mass.—Howland Lamp Manufacturing Co. Capital, $50,000. To manufacture incandescent lamps. Incorporators: Fred C. Howland and Thomas Murphy, Malden; and Charles M. Waugh, Cambridge, Mass.

New Bedford, Mass.—Gardner Storage Battery Co. Capital, $100,000. To manufacture storage batteries. Incorporators: Frederick W., Harold and Walter Gardner.

Angola, Ind.—Electric Safety Equipment Co. Capital, $25,000. To manufacture electric equipment. Incorporators: J. B. Fitch, H. G. MacLellan and E. A. Skinner.

New York, N. Y.—Kialto Electrical Co. Capital, $10,000. To manufacture electrical specialties. Incorporators: E. and R. Goldberg, and C. Diringer, 185 Madison Avenue.

New York, N. Y.—Verne Manufacturing Co. Capital, $40,000. To manufacture electrical specialties. Incorporators: S. S. Rand, S. T. Paley and H. S. Mansfield, 55 Liberty street.

Brooklyn, N. Y.—Alfred Covered Wire Co. Capital, $15,000. To manufacture electrical wires. Incorporators: A. Gleckel, J. H. Johansen and J. C. Von Glahn, 115 Broadway.

Buffalo, N. Y.—Ajax Battery Co. Capital, $1,000,000. To manufacture storage batteries and other electrical products. Incorporators: G. N. Culbertson; C. M. Gallagher and E. H. Hill.

Osceola Mills, Pa.—Mid-State Electrical Engineering Co. Capital, $25,000. To operate as electrical engineers. C. C. Bange, Philipsburg, Pa., treasurer.

Fort Wayne, Ind.—Brueckerlite Manufacturing Co. Capital, $75,000. To manufacture deflectors and other electric lighting specialties. Incorporators: L. E. Gollmer, J. G. Klett and J. C. Strodel.

New Orleans, La.—Guerin Theater Seating System, Iberville street. Capital, $500,000. To manufacture an electrical indicator board for theater seating. Incorporators: Morinville Guerin, president.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Apparatus (35,163)—An engineering company in Palestine desires to purchase and secure an agency for the sale of small electrical installations; electrical appliances and fittings, etc. Quotations should be given c. i. f. port in Palestine. Payment to be made against documents. Reference.

Electrical Appliances (35,147)—A merchant in Scotland desires to secure an agency and purchase electrical appliances, electrical household fittings, flashlights and batteries, etc. Quotations should be given f. o. b. New York City. Payment to be made through a local bank. References.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Investment Situation and Strong Position of Utility Securities.

During the past 18 mo. the investment bond market has experienced a number of exceedingly good investment periods, according to J. H. Briggs, manager of the Bond Department of H. M. Byllesby & Co., Chicago, which have always been followed by like periods of depression. There has been no sustained buying power to carry the markets along for more than short periods, with the result that a large number of investment offerings have been crowded in close succession in these short periods, actively competing with and bidding against each other for the public's favor, and producing a rather uncertain and unsettled condition in the bond market.

The axiom that bond prices advance in direct ratio to the fall in commodity prices is true today, but the decline in commodity prices was so drastic and so quickly brought about that for the time being bond prices in direct proportion are somewhat out of alignment. It is inevitable that this condition will right itself, and that further gradual declines in commodity prices, which are expected to come, will be accompanied by gradual inclines in bond prices.

One of the outstanding features of the present market, and of the market for the past 3 yrs., has been the enormous buying power developed in the small investor. This feature has been emphasized many times since the Liberty Loan and Victory Bond campaigns, but its worth to the investment bond business and the stability which this large distribution on a small scale has added to the bond market, has never been closely analyzed nor fully appreciated.

In this connection, it is interesting to note from a recent compilation of the Government Loan Association that over $1,000,000,000 of the Government War issues were taken from banks during the 18-mo. period ended Dec. 30, 1920, and placed with investors—so that approximately 90% of these bonds are now held by investors and corporations.

Rail, industrial and oil issues all appear to be out of favor with the investing public at the present time. The one group of securities, excepting of course governmental, state and municipal issues, which stand out today in distinct favor are public utility securities. Utility corporations were the first to feel the brunt of war-time conditions, were the first to adjust themselves to meet these conditions, and have proven to be the first to completely recover from the ill effects of the war period. The spreading of the doctrine of customer-ownership by the sales of utility securities in the territory served, the more complete understanding by the public of the necessity of compensating rates, better regulation and jurisdiction by state utility commissions, the fact that their product is an absolute necessity—all have added to the high regard in which these securities are held today by the investing public.

American Telephone & Telegraph Co.'s Earnings.

In his report to the stockholders of the American Telephone & Telegraph Co., President H. B. Thayer makes the following statement: "Our earnings for the first 6 mo. 1921 show a safe margin above our dividends, not taking into account our interest in the undivided profits of the associated companies. In spite of the slowing up of general business, the exchange and toll traffic of the Bell System is larger for the first half of this year than it was for the corresponding period of last year. The growth in subscribers' telephones has also been uninterrupted and a net gain of approximately 285,000 telephone stations has been made during the first six months of the year. This growth has been already financed and is now on a revenue producing basis. With the service as a whole better than ever given previously in this country or elsewhere, there is a spirit in the entire organization which will not be satisfied until still higher standards have been reached."

A summary of the report follows:

	6 mo. ending June 30, 1920.	6 mo. ending June 30, 1921.*
Earnings:		
Dividends	$17,397,835.23	$18,414,407.26
Interest	6,075,226.99	6,402,376.36
Telephone operating revenues	28,180,622.05	28,559,711.19
Miscellaneous revenues	106,035.73	52,360.47
Total	51,759,720.00	53,428,855.28
Expenses	16,009,260.22	17,048,729.81
Net earnings	35,750,459.78	36,380,125.47
Deduct interest.	9,421,796.46	9,868,022.21
Balance	26,328,663.32	26,512,103.26
Deduct dividends	17,682,342.87	†18,938,596.66
Balance	8,646,320.45	7,573,506.60

*Subject to minor changes when final figures for June are available.

†Includes dividends at 9% for second quarter.

Northern States Power Co.

The statement of the Northern States Power Co. and subsidiaries for the year ended March 31, 1921, shows net income after taxes, interest and depreciation of $1,992,055. The income account for the year ended March 31, 1921, follows:

Gross	$12,434,526
Expenses and taxes	7,769,973
Net	4,664,553
Other income	110,829
Total income	4,775,382
Interest	2,308,327
Depreciation	475,000
Net income	1,992,055
Preferred dividends	1,400,350
Amortization of debt discount and expense	250,000
Surplus	341,705

Brooklyn Edison Co.

The statement of the Brooklyn Edison Co., Inc., for the year ended April 30, 1921, shows surplus after taxes, interest and contingencies reserve, of $1,789,145, equivalent to $10.20 a share earned on the outstanding $17,366,300 capital stock. The income account for the year ended April 30, 1921, follows:

Gross	$14,386,408
Expenses and taxes	11,015,828
Net operating revenue	3,370,580
Other income	125,691
Gross income	3,496,271
Interest, contingencies, reserve, etc.	1,707,126
Balance	1,789,145
Dividends	1,388,340
Appropriations	122,125
Surplus	278,680

Southern Utilities Co.

	1921.	1920.
May gross	$ 233,400	$ 210,434
Net after taxes	49,605	35,221
Total income	49,467	35,290
Surplus after charges	29,197	18,582
12 mo. gross	2,823,973	2,323,435
Net after taxes	557,758	429,037
Total income	560,614	431,100
Surplus after charges	327,845	228,404

Mountain States Power Co.

12 mo. ended May 31.	1921.	1920.
Gross earnings	$955,696	$850,682
Net earnings	287,784	279,358

Mobile Electric Co.

12 mo. ended May 31.	1921.	1920.
Gross earnings	$739,960	$754,542
Net earnings	229,789	199,125

Louisville Gas & Electric Co.

12 mo. ended May 31.	1921.	1920.
Gross earnings	$4,770,114	$3,956,826
Net earnings	2,167,502	1,952,320

Dividends.

	Term.	Rate.	Payable.
Brooklyn Edison	Q	$2	Sept. 1
Cons. Util., pfd.	Q	1.5%	Aug. 1
Conn. Ry.&Lt., com.	Q	1½%	Aug. 15
Conn. Ry.&Lt., pfd.	Q	1½%	Aug. 15
Idaho Pr., pfd.	Q	1.75%	Aug. 1
Kellogg Sw. & Sup.	Q	2%	July 30
Phila. Co., pfd.	SA	1.25%	Sept. 1
Sierra Pac. El., pfd.	Q	$1.50	Aug. 1
So. Cal. Edison	Q	2%	Aug. 15

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid July 18.	Bid July 26.
Adirondack Electric Power of Glenns Falls, common	6	9	9
Adirondack Electric Power of Glenns Falls, preferred	6	67	69
American Gas & Electric of New York, common	..	98	100
American Gas & Electric of New York, preferred	6	36½	36
American Light & Traction of New York, common	..	79	82
American Light & Traction of New York, preferred	6	77	77
American Power & Light of New York, common	4	53	53
American Power & Light of New York, preferred	6	64	62
American Public Utilities of Grand Rapids, common	..	6	6
American Public Utilities of Grand Rapids, preferred	7	17	17
American Telephone & Telegraph of New York	..	103	104
American Water Works & Elec. of New York, common	..	3½	3½
American Water Works & Elec. of New York, particip	7	8	8
American Water Works & Elec. of New York, 1st preferred	..	47½	47½
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	27	27
Cities Service of New York, common	+extra	112	116
Cities Service of New York, preferred	6	41	43
Commonwealth Edison of Chicago	8	100	109
Comm. Power, Railway & Light of Jackson, common	..	9½	10
Comm. Power, Railway & Light of Jackson, preferred	6	29	30
Federal Light & Traction of New York, common	..	5½	6
Federal Light & Traction of New York, preferred	..	39	42
Northern States Power of Chicago, common	..	41	38
Northern States Power of Chicago, preferred	ex.div. 7	78	78
Pacific Gas & Electric of San Francisco, common	..	53	53½
Public Service of Northern Illinois, Chicago, common	7	79	79
Public Service of Northern Illinois, Chicago, preferred	6	80	80
Standard Gas & Electric of Chicago, common	..	8½	8½
Standard Gas & Electric of Chicago, preferred	8	31½	31
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	3½	3½
Western Power of San Francisco, common	..	23	23½
Western Union Telegraph of New York	..	84	85
Industrials—			
General Electric of Schenectady	8	119	124
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42	44¼